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WEEDS TREES & TURF

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Entering the Computer Age: Avoid the Panacea Approach

Conditions Favor Gypsy Moth, Northeast Under Alert

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CONTENTS

MAY 1981/VOL. 20, NO. 5

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Outlook 3

Landscape Contractor News 7

Government Update 11

GREEN INDUSTRY NEWS

Design awards presented by National Landscape Association . . . Nursery Marketing Council urges promotion during drought . . . Reagan proposes $6 million cut in EPA budget . . . Firestone Country Club no longer under tire company management. 5

FEATURES

Entering the Computer Age: Avoid the Panacea Approach
Equipment columnist Dave Johnstone warns about overdramatizing the immediate benefits of small computers and suggests reports to seek in program planning. 12

Conditions Favor Gypsy Moth Outbreak, Northeast Under Alert
Communities and homeowners brace themselves for another annoying spring of leaf-eating crawlers, and the experience is spreading to other parts of the country. Arborists and extension entomologists report on this pest of locust proportion. 16

Increasing Role of Insect Pheromones From Indicator to Control
This here-to-stay component of integrated pest management is fully explained by Ian Weatherston of Albany International, a leader in pheromone research. 28

Netting Makes Fescue Sod Practical in Nine Months
Tall fescue sod could serve a valuable function in the transition zone but it lacks suitable rhizome structure for sod. Netting makes tall fescue sod a practical reality. 32

Engine Life, Fuel Efficiency Improve
Changes in engine design and a move toward diesel fuel are taking place. Read both sides of the diesel story. Tips for longer engine life and the latest engine models are presented. 37

Magnolia Cultivars Flower From April to August
Douglas Chapman describes good and bad points about the major North American cultivars of magnolia. Transplanting and maintenance tips are given with thought to cost and hardiness. 46

Vegetation Management 50

Sod Producer News 56

Events 57

Products 70

Classifieds 75

Advertiser Index 76

Cover: Female gypsy moth and egg masses. (Courtesy David Nelson, PH.D.)

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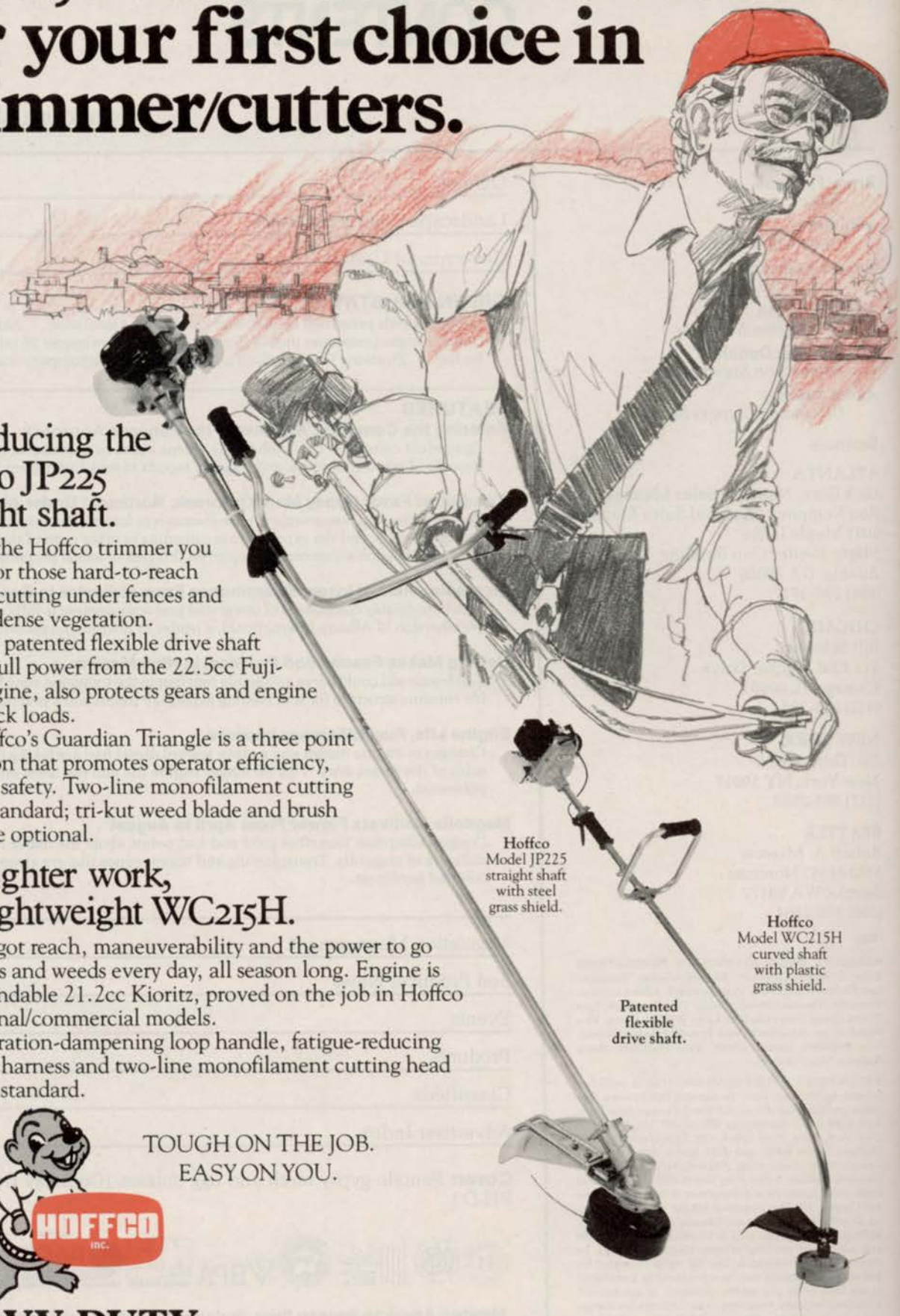

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OUTLOOK

By Bruce F. Shank, Editor

The high energy, aggressive business tactics of the 60's and 70's have temporarily fallen to the conservative, cautious methods of the 80's. Emphasis has switched from growth to control. Accordingly, concern over share of market and constant growth is now focused upon efficiency and taking care of the core business.

The questions now are: Will the pace and excitement of the 60's return? Will we be able to rein in our thought from new ventures to improving our basic skills? Will a temporary return to improvement of skills prepare us for another round of growth when recession lifts? And will we be satisfied with our positions in life and get off the fortune hunter kick?

Don't kid yourself. Although we will benefit from the temporary concentration on current skills, we will never have the slow, exacting pace of previous generations. Technology will not permit stagnation.

So, while we wait for the cloud to lift, we should be researching ways to expand our businesses. That computer you thought may not be necessary should be ordered and an employee trained to run it. If you have put off building needed storage space, get the blueprints back out and get bids. Hire a trainee for positions where growth will require backup like an accounting assistant, shipping clerk, or salesman. Now is the greatest opportunity to train for future needs.

How about design training for landscape contractors? My sources tell me enrollment in two- and four-year landscape design courses is high. As typical residential installations reach $5,000, copying out of landscape photo books will not work. Knowledge of low maintenance plant material and energy saving design is a valuable asset to the modern landscape contractor. Better knowledge of landscape structures is also advised. If landscape architects can specify structures at a cost two-and-one-half times the cost of plant material, so can landscape contractors with design capability.

Finally, do not moderate price increases expecting lower costs. The investment for growth has not vanished. If investment is delayed, invest in short term certificates. Don't pay off cheap credit. Be ready to roll when the opportunity is identified.

The businessman who uses slow periods to prepare for future opportunities will find economic recovery an organized, goal-oriented progression rather than a total rebuilding process. **WTT**

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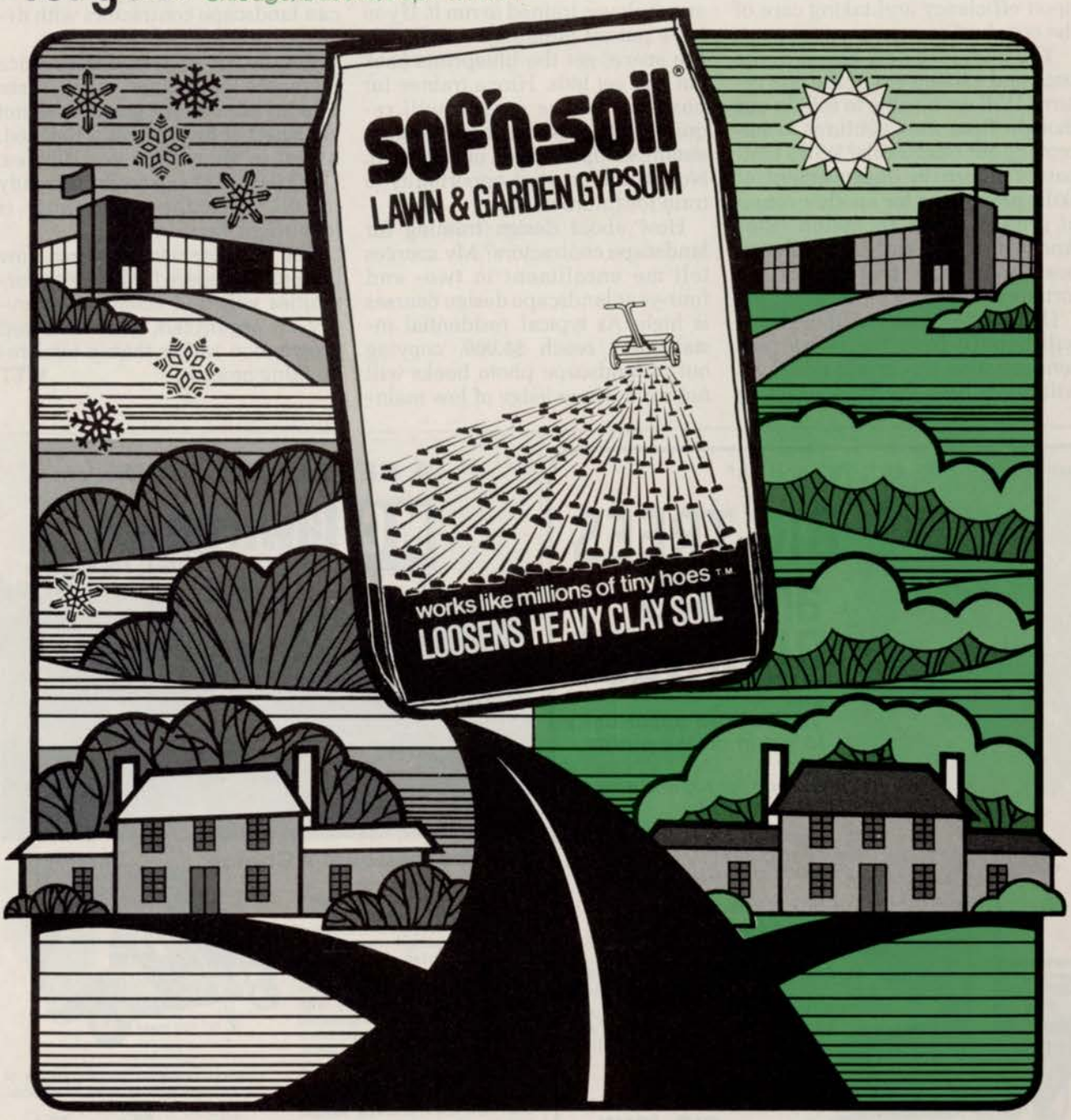

CHEMICALS DIVISION

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Outstanding residential designs take top honors

Landscape firms throughout the nation received six residential landscape awards and eight certificates of merit for distinguished work in residential landscaping by the National Landscape Association.

John Wight, Jr., president of the American Association of Nurserymen, presented the awards at a luncheon this winter during the Landscape/Garden Center Management Clinic in Louisville, Kentucky.

In the single family residence category, John Sterling of Sterling Landscape Co., Boise, ID, received one of two first place awards for the design and planting of a home in Boise. Chazz Cox Associates and Gateway Gardens, Inc., both of Florida, received the other first place award in this category for their design and planting of a Winter Park, FL, home.

Wight presented certificates of merit to Rudi Harbauer of Atlantic Nursery & Landscaping of Freeport, NY, for design and planting of a Bellmore, NY, home; and Alley Pond Nurseries of Huntington, Inc., Melville, NY, for design and planting of a home in Laurel Hollow, NY.

This single family residence in Laurel Hollow, NY, received a certificate of merit award from the National Landscape Association. Alley Pond Nurseries of Huntington, Inc., Melville, NY, did the landscaping.

The design and planting of this Bellmore, NY, home garnered a certificate of merit award for Rudi Harbauer of Atlantic Nursery & Landscaping of Freeport, NY.

The top honor in the entrance category went to Jim Gibbs of Green Brothers Landscape Co., Smyrna, GA, for his design and planting of an entrance area for an Atlanta home. Two others received certificates of merit: Thornton Landscape, Inc. of Maineville, OH, for landscaping the entrance to a Cresent Springs, KY, home; and Harold Timmer of Bunch Nurseries, Inc., Terre Haute, IN, for the design and planting of a Terre Haute home.

In the active use category, Steven Dubner Landscaping of Dix Hills, NY, was awarded the first place honors for a Dix Hills residence. Dubner also received a certificate of merit for a residence in Kings Point, NY, and Michael Hartnett of Contemporary Landscape, Inc., Fairlawn, NJ, received a merit honor for a residence in Pompton Lakes, NJ.

Two entries were recognized with first place awards in the passive use category. Vista Landscaping, Inc. of Orlando, FL, and Bunch Nurseries, Inc. of Terre Haute, IN, received first place honors for residences in their respective cities. Green Brothers Landscaping of Smyrna, GA, was awarded a certificate of merit for the planting of an Atlanta home and Lakeland Nursery of Willmar, MN, was awarded a certificate for the planting of a Spicer, MN, home.

This year's award winners will be displayed in color and in greater detail in the July issue of *Weeds Trees & Turf*. We will discuss the challenges each landscaper faced with his particular site and the judges' comments.

Continues on page 7

WOODS

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News *from page 5*

NURSERYMEN

Texas short course features merchandizing

Melvin Brady of Brea, California, gave Texas Nurserymen a brief course in marketing at the nurserymen's short course at College Station.

Brady talked about meeting the challenge of the discount chains by (1) defining your target market, (2) matching your inventory to that market, (3) finding the unique selling point to make your nursery different, (4) practicing differential pricing, and (5) providing knowledgeable service.

In merchandising, stores are usually classified by what they sell, Brady said. But he proposed a different classification, by type of merchandise: convenience, shopping, or specialty items. A nursery is a specialty store, he said, and its target market is the middle income, middle-age market — the people who are established in a home, have a family, and are interested in creating a beautiful environment for that family.

Neil Sperry of Dallas praised radio as an advertising medium for the nursery industry. In the past 10 years, Sperry said, radio listenership has gone up 63 percent while newspaper readership has gone down 4 percent. The cost of radio has risen 63 percent, while newspaper advertising has gone up 111 percent.

CONVENTION

Mid-Am/81 show sets record at new site

The 1981 Mid-America Horticultural Trade Show attracted 6,240 at the new Hyatt Regency Chicago, surpassing the former record of 5,744 that attended Mid-Am/80.

Landscape architects, landscape contractors, nurserymen, garden center operators, florists, and other horticultural professionals purchased more than $1.5 million worth of goods and services at the three-day show. Both buyers and suppliers, representing virtually every aspect of the industry, journeyed from all regions of the country to inspect products and services. Among the suppliers were sellers of plant materials, stock, all types of machinery and heavy equipment, soil conditioners, chemicals, lawn and garden accessories, watering systems, communications systems, ornamentals, tools, and data processing systems.

Continues on page 11

LANDSCAPE CONTRACTOR NEWS

HRI publishes 1979 operating cost study

The 1979 operating cost study, tenth in a series begun in 1965 by the Horticultural Research Institute, presents operating costs for retail, landscape, and production firms.

The study presents three separate cost studies in a single volume, according to HRI president, Bob Siebenthaler. "This means that retail garden centers, landscape firms, and growers can compare their operating costs with all other firms doing the same type of business and similar operations of comparable size," says Siebenthaler.

In an annual trends section, there is a seven-year comparative history, showing information gathered from previous studies for landscape firms, a six-year comparison for growers, and a five-year comparison for retail garden centers.

The study reveals that the total cost production for landscape firms decreases as sales volume increases. Conversely, gross profit increases slightly as sales volume increases. In addition, selling expenses decrease as firm size increases.

A copy of the full report can be obtained for $6.50 from HRI, 230 Southern Building, Washington, D.C. 20005.

Massachussetts pros discuss state topics

An expansive array of subjects and exhibits brought success to the seventh annual Massachusetts Hort Congress at Dunfey's Hyannis Resort.

The congress broke all records for attendance and exhibitors, who displayed nursery stock, sod, fertilizers, irrigation equipment, tools, chemicals, seeds, birdfeeders, and pottery.

The 1,000 registered attendees heard discussion on topics, such as gypsy moth control, guarantees, marketing, fertilizer, cost accounting for proper bidding, and trends in workmen's compensation. One speaker examined energy saving usages of plant material and another discussed horizontal and vertical solutions to difficult landscape situations.

Members of the Massachusetts Nurserymen's Association and Massachusetts Arborists Association moderated the educational sessions. These groups, along with the state's cooperative extension service, sponsored the event.

Brochure published for consumers of L.A.

The California State Board of Landscape Architects has recently published a brochure entitled, "Professional Responsibility: The Landscape Architect," authored by Nancy Hardesty, current president of the California State Board.

The brochure supports Governor Jerry Brown's policy of consumer protection and education. This policy is further reflected in the governor's appointments to the board, which now has four public members and two landscape architects, Ms. Hardesty of Northern California and Paul Saito of Southern California.

Ms. Hardesty has spent two years assembling the data for the brochure, which is written "in an easy, light style for consumer understanding," she says. "It describes the landscape architects' educational background, areas of expertise, design responsibilities and California license requirements, and includes a section on how to locate and hire a landscape architect." The board plans to distribute the brochure at local chambers of commerce, city and county building departments, and at high school career days.

MERIT

A Widely Tested and Highly Rated Superior New Kentucky Bluegrass

At a wide variety of locations, in comprehensive trials, Merit Kentucky Bluegrass has proven itself one of the better new varieties on numerous counts.

Merit consistently rated high in disease-resistance, turf quality and color. Merit produces a dense, dark green, high quality turf, and has also shown good resistance to leaf and dollar spot.

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- New York trial — Merit ranked above Baron, Kenblue and Park.
- Three-year Ohio trial (two locations) — Location # 1, Merit rated above Nugget, Fylking and Kenblue. Location # 2, Merit's ratings superior to Baron, Nugget, Kenblue and Fylking.
- Four-year Missouri trial — in season-long turf-quality ratings, Merit highest in a field which included Baron, Bristol, Fylking, Nugget, and Bonnieblue.

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News *from page 7*

Information on next year's show, scheduled for Jan. 15-17, can be obtained from: Mid-Am, 4300-L Avenue, Rolling Meadows, IL 60008, 312/359-8160.

PEOPLE

Oscar Jacobsen dies; built mower empire

Oscar T. Jacobsen, co-founder and former president and chairman of the board of the company that manufactured and marketed the first power mower with an internal combustion engine, died February 1.

Jacobsen, 85, along with his father, Knud, co-founded the Jacobsen Manufacturing Company (now Jacobsen Division of Textron Inc.) in 1920 in Racine, WI. While initially testing the company's first product, the 4-Acre Power Mower, Mr. Jacobsen developed its first distribution network. He is also credited with developing the first power greens mower in 1924.

Mr. Jacobsen became vice president in 1930, and one year later pioneered development of the automatic recoil starter and the use of rubber tires on lawn mowers. In 1938, he was named president and general manager, and introduced the Lawn Queen, Jacobsen's first power lawn mower for homeowners. He became chairman of the board in 1958, a position he retained until 1969 when the company was acquired by Allegheny-Ludlum.

GOLF DESIGN

Designer expects courses like old days

Joseph Finger, a golf course architect, predicts that unless something is done soon to bring down the cost of golf course construction, "Golf will revert to the rich man's game it was 75 years ago."

Speaking at the Southwest Turfgrass Association and New Mexico State University, Finger told participants that the golf course with "wall to wall greens" is too expensive to build and maintain and uses up precious natural resources. Golf course designing, he said, is one third golf, one third engineering, and one third agronomy.

Construction and labor costs are escalating right along with interest rates and taxes. A natural rough which uses low growing natural grasses is one way to save money and add character to a course, Finger said. A natural rough with intensively maintained greens, tees, and fairway landings also could save on water use and pumping cost.

Low maintenance natural terrain also requires less herbicides, fungicides, and insecticides. Finger also suggested designers be choosey about site selection, keeping in mind the high cost of excavation. A good designer could cut down on the acreage needed for a

Continues on page 66

GOVERNMENT UPDATE

Reagan proposes $600 million cut in EPA

The Reagan administration in across-the-board cuts has proposed to cut the 1982 Carter operating budget of $1.43 billion for the Environmental Protection Agency to $1.39 billion. Personnel levels have been cut from 10,621 to 10,387 in fiscal 1981 and are proposed for additional cuts in fiscal 1982.

Specifically in 1982, water pollution control will be cut $96 million; research and development related to environmental effects of energy development will be cut $34.8 million; plans for controlling solid wastes and reusing materials will be cut $12 million; the noise pollution program, $2.3 million, will be completely eliminated; and pesticide programs will be cut $7.6 million. Superfund money for hazardous waste dumps will be increased by $200 million in 1982 after an increase of $68 million this year.

Most of the pesticide program money would have been spent on efforts to establish registration standards and for integrated pest management, the latter being transferred to the Department of Agriculture. Additions include $1.9 million for RPAR contracts for risk-benefit assessments. Personnel levels will be reduced from 885 this year to 718 in 1982.

EPA decision clears registration of Sevin

The Environmental Protection Agency has decided not to issue a rebuttal presumption against registration (RPAR) for carbaryl (Sevin), a broad-spectrum pesticide used as an insecticide/acaricide and plant growth regulator.

After four years of study, the agency concluded that carbaryl should be returned to the registration process. However, the agency will require additional data from registrants to support existing registrations under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), as amended, and will negotiate appropriate label changes, outside the RPAR process, to ensure that exposure to carbaryl is held to reasonable levels.

The pesticide is registered by the EPA for control of more than 545 different pests on 100 uses, including home and garden, fruit and forage, forest and rangeland, field and vegetable crops. The active ingredient, Sevin carbaryl insecticide, is manufactured by Union Carbide and is formulated by nearly 300 U.S. firms for use in 1,500 federally registered products.

Insects' covering may control life cycle

Scientists in Kansas and North Dakota will study ways to curtail the formation of insects' tough outer covering as a possible new biochemical method of insect control.

Both studies involve chitin, the major component of insects' outer coverings, which is synthesized, maintained, and degraded to precise levels at specific times during an insect's life cycle. It is hoped that the research in the 20-month project will aid in developing new kinds of chemicals that interfere with chitin synthesis, according to entomologist Edwin Marks at the Metabolism and Radiation Research Laboratory, Fargo, ND.

The work will occur at North Dakota State University, Fargo, and Kansas State University, Manhattan, under cooperative agreements with the U.S. Department of Agriculture's Science and Education Administration.

ENTERING THE COMPUTER AGE: AVOID THE PANACEA APPROACH

New monthly feature to assist the landscape market with equipment purchase, rental, maintenance, and business management.

Dave Johnstone has more than 15 years experience in the construction equipment market. He has managed product introduction to the construction and rental equipment markets and has worked for a rental industry association. He has hands-on experience with nearly all types of outdoor equipment. If you have topics you would like Dave to address, you may write him at 267 Willow St., New Haven, CT 06511.

Now that microcomputer systems are available for as little as several thousand dollars and canned programs are offered for $30 and up, you may be tempted to experiment. Don't — unless you can tell from your own experience or the recommendations of your accountant and two outside management consultants that it will be a good idea. While computers are extremely useful where their unique abilities can be utilized, they are no panacea for every business. Sometimes, making a computer installation is like using an elephant gun to hunt mosquitos. And what's worse, if the computer installation is not tailored to your specific business or your business records are not tailored to the chosen computer installation, the computer can damage your operation.

It was only a handful of years ago that a computer salesman in southern California had to turn down three out of four of his hospital prospects, because the hospitals did not have the requisite underlying accounting system. If you've had the misfortune to have a hospital bill recently which you've studied before relaying to the insurer, you have seen for yourself that health care invoices are still a jumble with little relation to services provided. There are perhaps two reasons for this bookkeeping illiteracy: the skyrocketing demand for health care services and the origin of hospitals as charitable institutions. It probably does not afflict proprietary institutions.

Oddly enough, it took banks two or three generations of computers to get used to them, and, here and there, a bank official will still make a loan decision without consulting the computer printout under his elbow, with a disastrous result.

And plenty of other enterprises that should be using computers efficiently are not, even though they are staffed with programmers, data processors, information specialists, and experts in communications.

Computer is Certain To Change Your Business

The chief contribution of the computer (which is really only a high-speed adding machine) is its ability to provide information extremely rapidly.

This ability is responsible for a difference in degree so marked as to become a virtual difference in kind. The data produced by a computer is no more comparable to the data generated by slower methods than time-lapse photography or X-ray photography is comparable to the usual snapshot.

People who have had experience with computers say that the new information supplied gives an entirely different picture of business strengths and weaknesses than they had imagined. The new information may prove to you that a given activity is making no contribution to profit or a very little contribution to profit or that the expense of serving a specific account does not justify handling it. It may underscore the fact that to protect profits full-time people had best be replaced by part-time people. Or it may tell you (if your business is in the snowbelt) that a winter vacation had best be replaced by seasonal diversification. Or that the time has come to unload some seemingly good equipment.

The computer information will point up as no other information can inefficiencies and inadequacies and time squandering and poor money management and failure to develop markets. If you have an analytical turn of mind, great. If you don't and it happens that you don't care for business administration, the frankness of computer printouts can be frightening, uncomfortable, shocking. When a computer is installed, there's inevitably a feeling that control has been lost to an infernal machine. In the first months, you and your office staff are likely to rebel. To utilize your computer, you'll have to make a conscious effort to digest the data — particularly at first.

Reports You'll Want From Your Computer

In the area of financial and operations control only, depending on the size and scope of your business, you will probably want weekly, monthly, quarterly, half-year, nine-month, and annual reports on the following (we figure you won't need daily reports for awhile, although sizable businesses require them):

Key Operating Ratios, which include the current ratio (current assets to current liabilities); acid test ratio (inventories are omitted); absolute liquidity ratio (receivables are omitted); receiva-

Continues on page 14

WANT A BUSINESS PARTNER TOUGH ENOUGH TO BULLDOZE THE BACKLOT?

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Computer *from page 12*

bles turnover ratio (the rate at which cash is generated by the collection of receivables); and return on investment.

Receivables Aging Report By Customer: The trend here is to slap a finance charge on unpaid accounts after 60 days. People who have done this report a 35% improvement in collecting very old accounts.

Contribution to Profit of Any Equipment (which report will involve an ongoing rundown on equipment utilization piece by piece) and/or Any Specific Activity (which report will fold in labor and overhead, including absorbed service costs).

Cash Journal (which details receipts), Expense Journal (which details expenses), General Ledger.

Balance Sheet, otherwise known as Profit & Loss Statement (you may want to wait for the end of a normal reporting period, the month, for this one).

Customer Activity by Size of Transaction, Type of Transaction, Frequency of Transaction (this will let you know exactly where your business is coming from and will keep you from investing time and money in dead wood. If your business follows the general trend you are probably getting 80% of your volume from 20% of your customers and customers who have not dealt with you for two years have probably slipped away from you).

You may want more reports. You may be able to get by with less. Speak with your accountant and office staff.

The computer, as a device, is exceptionally good at forecasting based upon past experience into the future and at estimating the cost/benefits of management decisions. Use it at its highest level and not as an expensive substitute for a printing press, as with "personalized" letters.

Plan on Using Your Computer To Its Fullest

Whether or not you should get a computer will depend on the applications. If you are not going to use the computer in marketing and in plotting the direction your company should grow, then probably you can get by with:

a) Assigning specific computer tasks, such as General Ledger maintenance, or payroll, or promotional mailings, to outside specialists (you will probably turn to a specialist for promotional mailings, in any case).

b) An in-house office set-up limited to electronic calculators.

c) Manual computation.

If, however, you want to fine-tune your company's profitability, then by all means consider a computer *whatever your present volume.*

Software is Probably The Most Important Consideration

A couple of warnings drawn from the experience of others: The critical factor in getting ready to install a computer is not so much hardware as the accounting "bed" preparation. You may be certain that your computer will not make a measurable contribution to profitability for the one to two years you'll spend debugging programs. In general, the weakest link of a business installation is the speed of the hard-copy printer, which can be irritatingly slow. It is in the printer, too, that mechanical breakdowns are most likely.

Don't look on a computer as a permanent acquisition. You'll unplug and plug in new models as frequently as you buy your trucks. Perfect information delivery is an unattainable ideal, and your needs will change as your business develops.

Make sure your programmer or your business consultant allows sufficient information to be inserted in your customer records. This may mean that certain computers or certain canned programs will be inadequate.

Don't count on buying a canned program. Ownerships now are being questioned in civil suits. Your business is unique, and your programs must be written to your specific needs.

Recommended Approach

If you've decided on computerization, go gently, slowly, carefully: your business and the morale of your people are at stake. Be certain that someone on your staff takes a computer science course, so that there will always be an in-house authority. When the course is nearly finished, ask for at least two systems bids from management consultants who know hardware, software, programmers, and the questions to ask you. To familiarize yourself with the field, you might pick up one of the under $2,000 central processing units that use an ordinary television set for display and an ordinary cassette tape recorder to store the program. But don't count on such a set-up to make an operational contribution to your business.

At last count, there were 800,000 computers in the free world, doing the work of 6 trillion clerical people (or 1,500 times the number of people in existence). The computer is here to stay, and you'll probably need it for rifled marketing as well as for financial and operational management. The time may come when your computer can assist you in a technically agronomic way. There is no reason, for example, why you cannot record a customer's soil composition as well as his payment history. **WTT**

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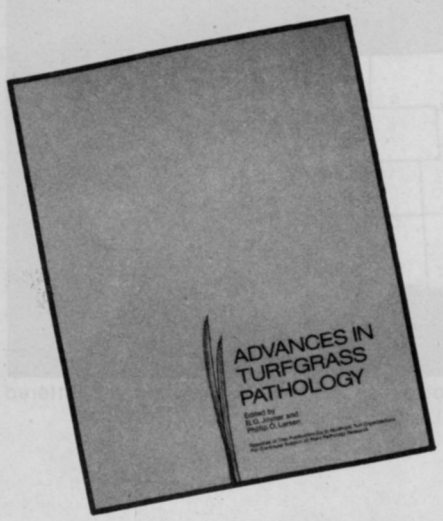

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WTT

SCIENTISTS FIGHT GYPSY MOTH SPREAD WITH INTENSIFIED ATTACK

By John Kerr, Associate Editor

"It is hard to describe if you haven't seen it," says Bill Rae, an arborist in the Boston Area. It defoliated 5.1 million acres of urban and rural forest in 1980. It will likely eat much more foliage in 1981 as it spreads south and west.

The gypsy moth, *Lymantria dispar*, the nation's number one shade tree insect, persists and thrives in the heavily infested Northeast. Scientists, diversifying their attack on the hungry insect, have stepped up their efforts as it multiplies. Arborists have attempted to use scientific research to counter one of the most challenging problems they have faced. Homeowners, in a state of entomophobia, are locking their windows and shuddering as caterpillars drop like hailstones on their rooftops.

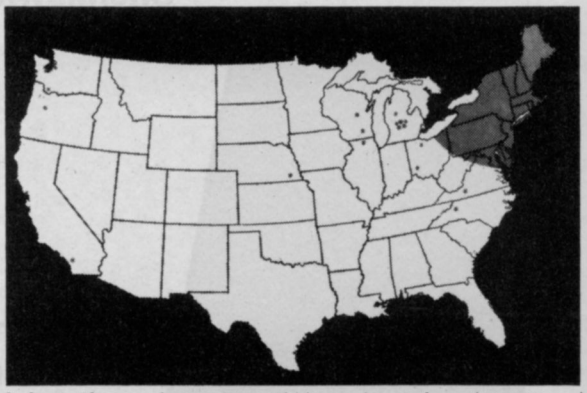
Rae has had to refuse orders since March. Other arborists are inundated with calls. "People will do anything to get rid of them," Rae says. "Even people who don't believe in spraying are now doing it."

Although professional arborists and the U.S. Forest Service have become extremely cautious from environmental pressures, the problem has become so severe that it has solidified forces against the insect. Since the beginning of this century, millions of dollars have been spent in efforts to control gypsy moth populations.

Early outbreaks occurred only in New England; today the insect threatens nearly half the states in the U.S. Excitement has reached a pitch because the gypsy moth, unlike agricultural pests that consumers seldom see, directly affects homeowners, campers, and nature lovers.

Traditionally, management of such a pest has been accomplished through pesticides. At a minimum of $5 an acre, the cost of spraying millions of acres questions its practicality. Charles Schwalbe, director of the Otis methods development center with the Animal and Plant Health Inspection Service (APHIS), thinks both cost and a feeling of helplessness contribute to negative reactions toward spraying. Schwalbe says, "I think that more people are beginning to feel that when the gypsy moth reaches these peak populations, the best action is inaction—let nature take its course."

More than cost and fear though, researchers and field applicators believe that pesticides can not do the complete job. A management approach integrating pesticides with biological agents and natural elements and predators pervades the minds of the leaders in the scientific and industrial communities. Integrated pest management (IPM) has become not only a popular concept, but a necessity.



Infestations of gypsy moth have been found scattered throughout the United States.

Man's role

More than any other insect problem, gypsy moth thrives under man's domain. Defoliation often occurs in populated areas, especially where homes and developments are located in previously forested land. Spruce budworm is an extremely bad problem in the northern U.S. and Canada; the Douglas fir tussock moth, found mainly in the western U.S., infests thousands of forest land acreage. But these two insects attack contiguous stands of conifers, mainly overmature trees.

The gypsy moth feeds on many types of trees, although it prefers oaks, and has a tremendous capacity to adapt to different regions. It has been found in Japan, China, Australia, and Europe. In the past year, infestations in the United States have been discovered in Washington, Oregon, California, Nebraska, Minnesota, Wisconsin, Indiana, Illinois, Michigan, Ohio, West Virginia, Virginia, and North Carolina. This spread southward and westward happens because of man's activities.

Campers, firewood, nursery stock, and anything else that moves or is moved from parts of the Northeast may contain gypsy moth. The federal government is trying to regulate this movement, but it is not an easy task. The state of Virginia inspects thousands of vehicles every summer. Officials try to inform Christmas tree growers and nurserymen that if their area becomes infested, it must be kept under quarantine.

All nursery stock in the Northeast is being closely watched for infestations of gypsy moth. APHIS monitors the stock being shipped and if any of it is infested, the owner is required to use some type of control program.

Continues on page 18

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The Minnesota Department of Agriculture last year prohibited importing trees supplied by three Connecticut nurseries after MDA officials confirmed that at least three shipments were heavily infested with gypsy moth egg masses. The prohibition remains until state and federal officials can certify their stock as disease and pest free. The Department's Division of Plant Industry has sent questionnaires to nurserymen and persons involved in government tree planting programs asking for the sources of tree stock planted in 1979 and 1980.

APHIS has used 75,000 to 100,000 traps a year to monitor gypsy moth populations in the Northeast. Campers and hikers have cooperated distributing the traps and picking them up at the end of the year. These programs have become particularly important to the states where populations have not reached outbreak proportions. Low levels of gypsy moth once detected can be localized and often eradicated. Homeowners can be warned to clean up yards, fences, and treehouses where the gypsy moth likes to rest during the day.

Egg mass hatching in the early spring shows the buff-colored larvae, which have rencently emerged, and the darker, older larvae.

At extremely high densities, (right) the gypsy moth caterpillars apparently do not use resting places at all until they are ready to pupate. Rather, they remain on the foliage, feeding continuously both day and night.

The professional arborist

Active pursuit by the National Arborist Association of a healthy and profitable IPM program is encouraging members and associates to expand their thinking. The high visibility of the industry to the public helps emphasize the importance of good planning and cultural practices. Much of these practices—monitoring, inspections, horticultural spray oils, *Bacillus thuringiensis (Bt)*, the use of parasites, predators, and resistant hosts—work in an attack against the gypsy moth. Many of these techniques, still in their infancy stages, must be refined and presented to the homeowners in an educated manner.

"Nothing is a complete, total panacea," says William Wallner, Forest Service project leader for the ecology and management of northeastern forest insect pests. "We must recognize all the alternatives. To expect a singular management approach to permanently solve such a complex problem as gypsy moth is naive."

The gypsy moth, because of its visibility, could not only promote IPM, but could help the arborist attain a position of extreme value. "It is a great opportunity for the professional arborist to assert himself in the public eye," says Erik Haupt, president of The Haupt Tree Co. in southwestern Massachusetts. High sell manufacturers will be advertising quick solutions to the problem. "They will be like the old medicine men," says Haupt, "selling a product if people need it."

Arborists agree that timing is a vital factor against the gypsy moth. Careful attention is being paid to egg mass hatching and proper time for treatment. This lets the arborist obtain maximum control with minimum treatment.

Haupt says some of his clients insist on biological control no matter how much he explains its limited effectiveness. This fact is another lesson to the arborist: you have to provide what the customer wants. Whether he's a property owner, golf course operator, or park superintendent, the customer desires and demands according to his own needs and wants. These desires are basis enough for an IPM program against the gypsy moth.

Since trees become more susceptible to disease and insect damage when they are weak, the arborist must keep them as healthy as possible before infestation occurs. Trees stressed with too little or too much water, frosts, leaf diseases, or herbicides are likely to suffer more drastically from gypsy moth defoliation than healthy, nonstressed trees. Unfortunately, even healthy trees can suffer from defoliation if enough of their leaves are removed in successive years.

The U.S. Department of Agriculture

Three USDA agencies—the Animal and Plant Health Inspection Service, Science and Education Administration (SEA), and Forest Service—coordinate federal-state efforts in regulatory, survey, control and eradication, research and development, and information and education programs.

APHIS, through its Plant Protection and Quarantine Programs, and state agencies from Maine to Maryland enforce regulations to prevent spread of the gypsy moth caused by people. In their regulatory work, APHIS and the states work closely with SEA, the Forest Service, and the Interior and Defense Departments. They also keep contact with such industrial organizations as the American Association of Nurserymen, Association of American Railroads, American Trucking Association, moving companies, airlines, the pulp and paper industry, the National Campers' and Hikers' Association, and other outdoor and travel groups.

Along with their work distributing thousands of traps, APHIS and the states conduct aerial surveys. These help identify the location and severity of defoliation and help predict where next year's damage will occur.

Control programs are designed to protect high-value recreation areas, forested communities, and timber resources from serious damage and spare homeowners the nuisance of crawling caterpillars in heavily infested areas. The Forest Service initiates control programs on federally-owned lands. On state and private lands, the Forest Service may participate but only at a state's request. Cost-benefit and biological evaluations must first be made and environmental effects of alternatives carefully considered.

Pheromones

The main method APHIS uses for trapping and monitoring the gypsy moth is sex pheromones. Pheromone traps have shown better success in low level infestations than in higher populations, where taking egg mass surveys can provide a better gauge. Spraying the gypsy moth pheromone, disparlure, into infested areas confuses the males who are seeking to mate with the non-flying females.

Excitement over the use of pheromones to control the gypsy moth problem has diminished in recent years. A leader in the research, Penn State University's Alan Cameron, has dropped his efforts after 10 years of study. "It is useful and valuable as bait for detection," Cameron says. "I'm satisfied we can't use it to reduce population in heavily infested areas." He bases his results on applications which are made to prevent mating after the damage has been done in a summer. If the application is effective, it would show lower populations the following year. This has not been proven.

Disparlure has been combined with biological agents, viruses, parasites, and chemicals and the gypsy moth has been eradicated. "I would not claim that the disparlure was responsible," says Cameron. "I also can't say it was not a part of the elimination."

Cameron thinks pheromones can be very useful as monitor tools, particularly in fruit orchards, to help get away from the calendar approach to spraying. In agriculture also, where a high dollar crop produces immediate returns on a spraying investment, an effective pheromone program could justify its cost.

The complexity of the gypsy moth's mating process leads Cameron to believe that other factors, such as visual and tactile senses, are involved. "There are too many factors to manipulate the population," he says. Even reducing the mating success 30 to 60 percent may not help when one egg mass may produce up to 1,100 eggs. "Their reproductive capacity is very high, particularly with new invading populations."

Cameron believes he knows disparlure's limitations. "The research was good in advancing the science, but frustrating because we are not much farther ahead than ten years ago."

Other ways of monitoring

When the gypsy moth hits its late third and early fourth instars (the male has five instars, the female six), it becomes active from its original

Continues on page 22

JOHN DEERE
650

"When our aircraft tug broke down for the last time, we replaced it with something reliable from John Deere."

E. K. Jones, Jr., President,
Iowa City Flying Service, Iowa

If it weren't for E. K. Jones, Jr., and his John Deere 850 Tractor, a lot of airplanes might never get off the ground.

Thirty times a day, he uses his John Deere to pull airplanes out of the hangars.

"It's a real nice tractor, and I haven't had any trouble with it," says Jones, after 1,046 hours of service.

But things weren't always so easy. Until a couple of years ago, he hauled airplanes with an old aircraft tug that gave him nothing but trouble.

"Every time it broke down, we had problems."

Which explains the feature Jones likes most about his John Deere 850 Tractor.

"It's maintenance free."

Small enough, yet big enough.

When his old aircraft tug finally died, Jones needed more than something reliable. He also needed something that was big enough to pull planes as heavy as six or seven thousand pounds. Yet small enough to be economical to buy and operate.

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resting spot underneath a leaf's surface. It begins to migrate from the foliage it feeds upon at night to resting locations on the tree's trunk or on signs, treehouses, stone walls, and other ground sites during the day. In the evening, it moves back up the tree.

Bark flaps of burlap or other materials wrapped on a tree trunk make a suitable resting spot and thus a trap for the gypsy moth. Here they can be collected and either killed or monitored. Research on the use of bark flaps for estimating populations, determining larval behavior, and aiding biological controls is being investigated by Wallner of the Forest Service in Connecticut.

Chemicals

Scientists now agree, as do most arborists, that pesticides are only a piece of the puzzle for total gypsy moth control. However, spraying insecticides is still the most thorough method of control and they cannot be ignored at this time to treat the gypsy moth.

If a trapping program in Virginia shows an isolated infestation, the Forest Service uses an intense spray program to wipe it out. According to John Weidhaas, extension specialist in entomology at Virginia Tech, the Forest Service will use Dimilin, an insect growth regulator, because it is highly specific to caterpillars. It is not approved for populated areas. Spraying occurs in the second or third week of May. Hitting the gypsy moth in its early instars is vital for any chemical to give maximum effectiveness. The application of Dimilin has been cut in half under acceptable weather conditions and then sprayed a second time in June.

Many chemicals are available, often limited by state regulations and to licensed applicators. The following chemical insecticides are registered: carbaryl (Sevin), trichlorfon (Dylox), acephate (Orthene), Imidan (a phosphate-type insecticide), Bidrin (a toxic insecticide used by injection), Malathion, and Methoxychlor. Diflubenzuron, (Dimilin), which prevents the gypsy moth from molting, is only registered for forest treatment.

At the Otis methods development center, where Charles Schwalbe directs the research, insecticide screening is a large project. The center screens biological and chemical compounds from industry to determine their toxicity to the gypsy moth.

Schwalbe describes the work like this: "We take registered insecticides and try to define their use patterns. We use the minimum efficient dose to receive the desired control. We improve formulations so they work better, concentrating on microbial insecticides. When you spray one, it doesn't last long; ultraviolet light breaks it down and rain washes it off. This is the main reason for erratic results."

Until recently, Schwalbe says, there has not been the concern of these two factors affecting insecticide residual. Research information has made manufacturers more willing to accept the results. The Otis laboratory has made significant progress with stickers to counter the wash effect

Gypsy Moth Food Plant Preferences

Most Preferred	Intermediate		Least Preferred
OAK	MAPLE	SOURWOOD	ASH
HAWTHORN	BUCKEYE	PINE	HOLLY
PAPER BIRCH	HICKORY	COTTONWOOD	MULBERRY
GRAY BIRCH	RED BUD	CHERRY	YELLOW POPLAR
APPLE	HACKBERRY	HEMLOCK	SYCAMORE
SWEETGUM	DOGWOOD	ELM	LOCUST
TAMARACK	PERSIMMON	SERVICEBERRY	FIR
ASPEN	BEECH	BLACK WALNUT	SPRUCE
WILLOW	MAGNOLIA	SASSAFRASS	RHODODENDRON
BASSWOOD	TUPELO	WITCHHAZEL	MOUNTAIN LAUREL

of rain. Ultraviolet penetration is a tougher problem.

Sterilized males

Another project Schwalbe's team deals with is rearing large quantities of sterile male gypsy moths. Cobalt 60 gamma radiation is used. It is important to get the right amount of radiation at the right development of the gypsy moth.

This research is now in its fourth year and is still preliminary. Last year, the first field tests were done in Michigan and they will be continued there this year. Schwalbe expects that the tests at low level populations will show how well the sterilized males mate and how they move in the field.

FEEDING RESPONSE OF 3rd INSTAR GYPSY MOTH LARVAE TO FOLIAR EXTRACTS OF VARIOUS PLANTS FROM NORTH AMERICA

STIMULANT	NEUTRAL	DETERRENT
DOUGLAS FIR	OLIVE	VIBURNUM
HONEY LOCUST	ROYAL PALM	GUMBO LIMBO
COTONEASTER	ELDER	MANGROVE
FORSYTHIA	SEA GRAPE	EUCALYPTUS
GINKGO	PAW PAW	ANDROMEDA
GIANT SEQUOIA	RASPBERRY	CAMELLIA
DEODOR CEDAR	BALD CYPRESS	LIME
THOMPSON SEEDLESS GRAPE	EUONYMUS	CAJUPUT TREE
CRAPEMYRTLE	WAX MYRTLE	PISTACIO
ALMOND	BLUEBERRY	CALIFORNIA LAUREL

Biological agents

Two entomologists, William Yendol from Penn State and Frank Lewis, principle insect pathologist at the Northeastern Forest Experiment Station, gathered sufficient data from studies to help get *Bacillus thuringiensis (Bt)* registered with the Environmental Protection Agency. After this success, they did the necessary research to register a gypsy moth virus, nucleopolyhedrosis (NPV), named Gypchek. "We did research and development of these microbials for control and utilization in IPM programs for gypsy moth management," says Lewis.

Bacillus thuringiensis, a spore-forming bacteria, comes in many strains, one of which is registered and produced under the names Dipel, Thuricide, and Bug Time. It kills the gypsy moth in its larval stage. When the insect eats the mixture of spores and crystals, the larva's gut is paralyzed. Ultimately, the insect starves to death or the bacteria grows and kills the insect by septicemia, or multiplication of the bacteria in the blood.

"We have mainly tried it (*Bt*) by itself," says Lewis. "We need much more work integrating these things, trying to substitute microbials for pesticides. We present it as an option. *Bt* works better when applied from the ground than the air."

The most devastating disease of the gypsy moth is that caused by the specific nucleopolyhedrosis that affects the larval stages of the insect. It is entirely specific to the gypsy moth. Like *Bt*, NPV is slow acting and harmless to the environment.

An insect becomes infected by eating foliage that has been contaminated with virus-containing polyhedral inclusion bodies (PIB's). The PIB's dissolve in the gut of the insect and release virus rods which first cross the gut wall and then infect blood cells. The disease progresses to the fat body and finally to cells of the integument (outer skin). An infected larva will show signs of the disease by loss of appetite, listlessness, a darkening in color, a moist-appearing integument, and often a tendency to climb upward. Infected larva usually die within 9 to 11 days and hang from foliage of bark in an inverted "V" position.

Dr. Yendol says present research is dealing with different forms of Gypchek and its mode of action. This year it will be studied in an attempt to improve the application technology, including aerial application rates, dosages, and its most effective ways to treat egg masses. Work focuses on incorporating the virus into pest management with pheromones, parasites, and insecticides.

Infectious diseases caused by bacterial pathogens are also important in gypsy moth regulation. Unlike NPV, which infects blood cells, these bacteria simply multiply in the fluid portion of the hemolymph (blood) and kill larvae either through the production of toxic substances or by depleting the insects of nutrients. Of these naturally occurring bacteria, *S. faecalis* and *S. marcescens* are probably the most effective in killing gypsy moth larvae.

Parasites

Another program to halt the rampage of gypsy moth is occurring in New Jersey under APHIS control. William Metterhouse is running the program which involves field evaluation and monitoring of gypsy moth parasites. Started in 1963, the field and laboratory studies have helped to introduce seven parasites and one predacious beetle into the population in New Jersey and New England.

Several species of small wasps attack the various life stages of the gypsy moth. One of the

Continues on page 24

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Gypsy Moth *from page 23*

most common species, *Ooencyrtus kuwanai*, is an egg parasite that can attack 30 percent of an egg mass and up to 90 percent of a small egg mass. *Apanteles melanoscelus* and *Phobocanpe disparis* wasps attack the larval stages. Another wasp, *Brachymeria intermedia*, stings the gypsy moth pupae but is most effective when gypsy moth populations are at defoliating levels.

Several fly parasites infect the gypsy moth. The most promising, according to Metterhouse, is *Parasetigena silvestris*. *Compsilura concinnata* attacks insects on more than 200 of their hosts. *Blepharipa pratensis*, another fly, lays its eggs on leaves and the gypsy moth caterpillar eats the eggs when it eats the leaves. A predacious ground beetle, *Calosona sycophanta*, which was imported from Europe, attacks both the larvae and adult gypsy moth.

"Parasites provide another regulating factor," says Metterhouse."The augmentation of parasites on low gypsy moth populations has become more important. More research is ongoing and all parts of the USDA are cooperating. An example of the cooperation between APHIS-SEH-Forest Service is the evaluation of parasites for vectoring microbial diseases to increase effectiveness of natural controls.

Predators

The gypsy moth's parasites are usually smaller than the host they attack and develop with a single individual. Predators usually are larger than their prey and consume many host insects during the course of their life. They are very active, live longer, and may prey upon a variety of insects, depending on what is available.

According to Harvey Smith with the Department of Agriculture's Northeast Forest Experiment Station in Hamden, Connecticut, the importance of predators has probably been underestimated because they consume their prey quickly and leave few if any remains. Woodland mammals can consume large numbers of gypsy moth larvae and pupae in forested areas. Some mammals eat only one life stage of gypsy moth, while others may eat as many as three.

Some mammalian predators of the gypsy moth include the white-footed mouse, shrews, chipmunks, moles, and squirrels. Shrews, which are often mistaken for mice, are voracious insect feeders that consume their weight in prey each day. Unfortuantely, mice and shrews are probably not important as predators in suburban settings because they are eliminated by domestic animals such as the common cat and because their natural habitat, forest litter, is frequently destroyed.

Many species of birds have been observed feeding on gypsy moth larvae or adults. Nuthatches, chickadees, towhees, vireos, northern orioles, catbirds, robins, and blue jays are proba-

bly more important in sparse gypsy moth populations. Cuckoos and flocking species such as starlings, grackles, red-winged blackbirds, and crows may be attracted to areas where the gypsy moth exists in large numbers.

Other factors

Numerous factors, often difficult to measure, contribute to the control and spread of gypsy moth. Ripe temperatures can trigger heavy infestations of the gypsy moth. An early thaw proceeded by severe freezing could reduce populations. Unfortunately for residents of the Northeast and surrounding areas, conditions appear healthy for the gypsy moth in 1981 and preliminary studies show this year may be the highest population ever.

Awareness of all facets of the gypsy moth—its life cycle, habits, and controlling agents—can make a major difference in a preventative rather than protective program. According to Dr. Cameron, "As the insect moves down through the south and west and the initial defense is beyond us, we seem to get into the situation in which we hope it doesn't get too bad. Then populations build up and we try to protect the areas threatened. It becomes a reactive program that develops over the years rather than a true management program with emphasis on prevention."

"How long it remains, no one is certain," says Dr. Lewis. "It is a cyclical insect in Europe; it subsides and reappears in Europe every seven to eight years. These cycles appear to be climate related." Barring dramatic changes in the climate, Lewis expects the insect to be at least as serious a problem in 1982.

"It will probably take more resources than we have now," Lewis says. "All our tools and tactics are being researched to collectively and selectively use for control. Our past experience of a single control has not solved the problem. Hopefully, we will have a longer term management."

Nobody is deluding himself with optimistic predictions. Dr. Cameron says, "We are a long way from broadly managing the gypsy moth in the U.S. This is part of the challenge and part of the work."

Dr. Schwalbe says, "The gypsy moth is a tremendously cosmopolitan insect. It occurs under such a variety of situations that there is just no way that within the extremely near future we will have the means to control it."

If anything positive has arisen from this devastating insect, it could be that government and industry are working together to solve the problem. The concept and activity of pest management has come alive and may soon be a household word. The gypsy moth could be the rallying force that makes IPM work. **WTT**

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THE GROWING ROLE OF PHEROMONES: FROM INDICATOR TO CONTROL METHOD

By Ian Weatherston, Technical Director, Albany International, Needham Heights, Massachusetts. Address delivered to the National Arborist Association Annual Meeting in February 1981.

Increased ecological awareness by the public has encouraged the commercial development of alternatives to some chemical toxins as a means of controlling insect pest species. Among the alternatives which show promise are sex pheromones.

The attractiveness of female moths to males of the same species has been known since the 18th century but it was not until 1959 that the word pheromone was coined and defined as, "A chemical message carrier between members of the same species, and beneficial to that species."

Organisms other than insects possess pheromones, but insect pheromones are our primary interest. Subsequently, pheromones were categorized according to their function, leading to "trail pheromones", "aggregation pheromones", "alarm pheromones", "territoriality pheromones" and "sex pheromones". The promise offered by sex pheromones as an alternative to insecticides is that they could be used in insect control without detrimental side effects on nontarget organisms and the ecosystem, and this has been the major driving force behind much pheromone research.

The first sex pheromone was identified in 1959, and today pheromones or attractants are known for more than 350 species of Lepidoptera belonging to 29 families (there are of course many more pheromones known—belonging to the Coleoptera, Hymenoptera and Diptera). The pheromones of the Lepidoptera are generally blends of relatively simple chemicals whose subtlety is a factor in maintaining species integrity. Within this blend components may be identified as causing long range orientation while others are classified as close range pheromones.

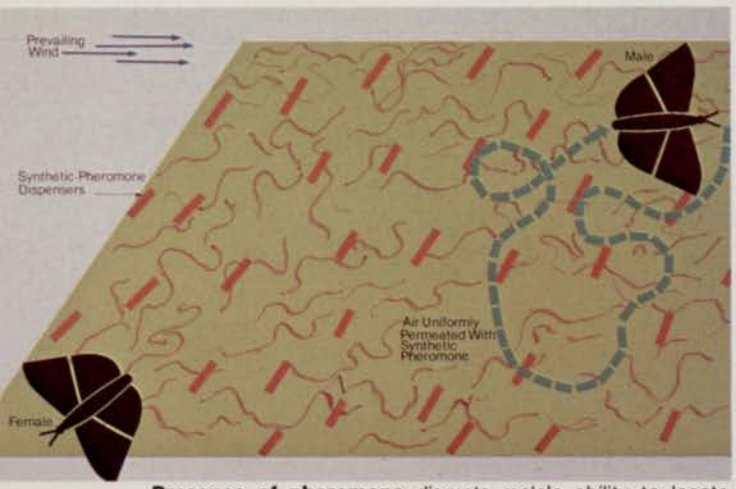
Although improved instrumentation has lessened the difficulty in isolating and identifying pheromones, and although there is frenetic activity in the field testing of pheromones, the commercialization has only recently begun to pick up momentum.

As you well know, there are two steps involved in pest insect population management. There is monitoring or surveying and there is the control or regulation of the numbers to an acceptable economic level. In both steps pheromones can play an important part. The Albany International system is used for control through mating disruption. Normally the female releases her pheromone, and the plume is carried downwind. A male can orient to the plume and find the female. However, when the air is permeated with the synthetic pheromone, the male is unable to find the female. For this strategy to succeed, the synthetic pheromone must be disseminated over a period of time minimally equal to the duration of the adult stage of the target pest. Our system used to obtain this controlled release is based on hollow fiber technology; that is, the pheromone in the fiber diffuses out of the open end at a steady rate. The rate of release is dependent on the internal diameter of the fiber, and of course, on the environmental temperature.

In 1980 we treated 66,500 acres of cotton in the United States and South America by this disruption technique for control of the pink bollworm. The material was aerially applied, with an average of three applications. The rate of application averaged 20 grams per acre of formulation which is equivalent to 1.52 grams of synthetic pheromone per acre. Other insects against which products have been commercially used with success are the western pine shoot borer in the Pacific Northwest and the tomato pinworm in Mexico. Development of application methods is also an integral part of creating diversity for the system; besides aerial application, hand and ground application equipment are available.

For monitoring, the pheromone system is composed of a trap and a lure. Information obtained is (a) presence of specific pests, (b) population density (although this is a very complex question), and (c) the determination of peak emergence on which to base a subsequent treatment. Traps come in a variety of shapes and types. Sticky traps include the delta trap, the ice-cream carton trap, and the wing trap. Advantages of

Continues on page 30



Presence of pheromone disrupts male's ability to locate female.

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*Testing was done on a **2:1 slope.** After soil preparation, the plots were seeded and mulched in one operation and allowed to lay overnight. Simulated rain controlled at the rate of four inches per hour was applied until a targeted deterioration of the surface occurred. Product effectiveness was evaluated by "apparent" rate of erosion which was calculated by dividing the total time until deterioration by the weight of the material eroded.

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Pheromone *from page 28*

these types of traps are that they are commercially available, easily handled, cheap, and disposable. The negative side is the trap's efficiency to catch a moth decreases as the number of moths caught increases.

Another type of trap is the wire cone trap. In this design the males are trapped in the upper portion and are unable to find their way out. The non-overloading trap is one in which the moth is attracted into the top portion of the trap, knocked down, by say vapona, and is collected in the lower portion.

The number of captures rises to a point where trap effectiveness drops.

The lure or pheromone dispenser used with the trap must release the pheromone at the desired rate. Generally when the concentration of the bait is increased, the number of captured insects also rises to an optimum point, beyond which the number of captures decreases. Materials which have been used as bait include rubber septa, polyethylene vial caps, beem capsules, dental wicks, cigarette filters, polymer matrices, and a lure composed of a parallel array of hollow fibers. The rate of release of hollow fiber arrays is dependent on the diameter of the fiber and also on their number.

Three insects of interest are the gypsy moth, the Japanese beetle, and clearwing borer. Although Albany International, at this time, does not manufacture products for the consumer market, we believe that this year several gypsy moth products will be introduced for sale to the home owner. It is highly probable that they will be part of a system which will also contain a killing agent. We do sell, however, a monitoring system for this insect. Pheromones are classified as biorational pesticides and as such, when used for insect control, must be registered by the Environmental Protection Agency. For strictly monitoring purposes registration is not required. However, trap and lure combinations purporting to be a control system require a registration.

A product which is commercially successful is aimed at controlling the Japanese beetle. It is known as Bag-A-Bug. This is not an Albany International product but it does use as the attractive source a combination of the sex pheromone and the floral scent.

The 1980 national insect pest priority list of the National Arborist Association identifies several borers, including dogwood borer, rhododendron borer, ash borer, peach tree borer, and lilac borer, in the top forty pests. The pheromone systems for 52 species of clearwing borers are known. **WTT**

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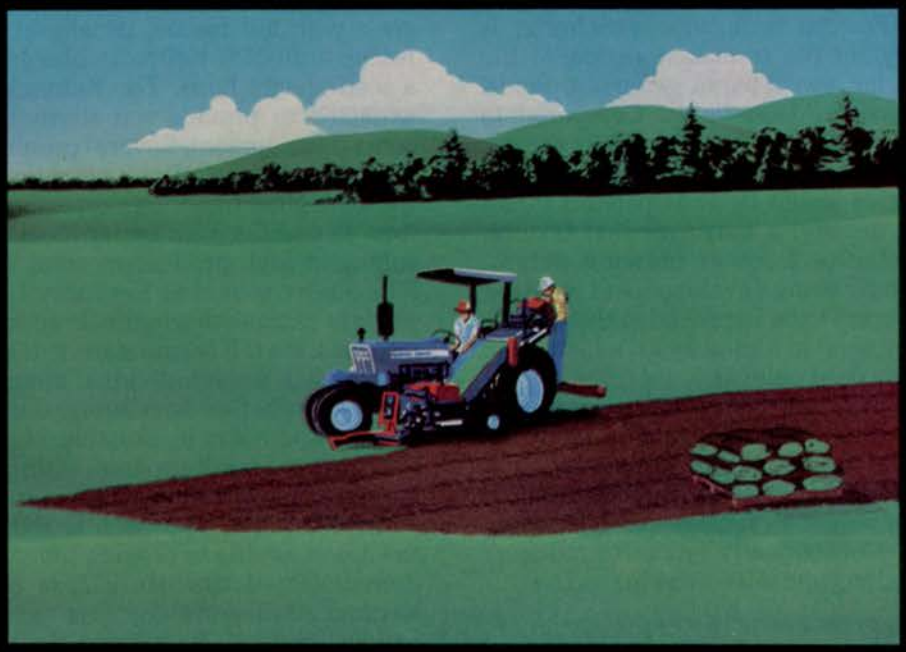

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NETTING, TALL FESCUE TEAM UP TO PRODUCE NINE-MONTH SOD

By R.N. Carrow, L. Leuthold, and R.W. Campbell, Department of Horticulture, Kansas State University, Manhattan, Kansas

Tall fescue (*Festuca arundinacea* Schreb.) is widely utilized in the transition region of the United States for lawns, parks, general grounds, and high school athletic fields. Compared to Kentucky bluegrass, tall fescue exhibits greater drought and high temperature tolerances. Wider use of tall fescue would be anticipated if it had greater shoot density, a narrower leaf texture, and could tolerate a lower mowing height. Cultivars are now being developed and released which are reported to be improved in these characteristics compared to Kentucky 31, which is the most commonly used cultivar.

Establishment of tall fescue has been almost entirely by seeding. Sodding would be an attractive alternative. However, tall fescue does not produce the long, interwoven rhizomes which provide sod strength necessary for harvesting and handling. Consequently few sod producers have attempted to grow tall fescue for sod.

Alternative Approaches

Some growers have seeded Kentucky Bluegrass with tall fescue, usually at a 75-90% tall fescue to 10-25% Kentucky bluegrass mixture on a seed weight basis. The Kentucky bluegrass is expected to provide sod strength through rhizome development. Several problems may occur with this approach. Production time to develop a sod with good handling properties is often more than 18 months even under ideal conditions, resulting in high production costs. Another problem observed is that Kentucky bluegrass often tends to become the dominate species. When this happens, the tall fescue starts to take on a bunchy appearance since individual clumps develop. If this occurs before harvesting, the sod quality is inferior and not as marketable. However, even if the clumping is not apparent at time of harvesting it often appears within a year of transplanting.

Harvestable in nine months, the fescue and netting combination exhibited tensile strength five to six times greater than tall fescue sod without netting.

An alternative approach to sod production is the use of netting to provide sod strength. Beard[1] demonstrated the usefulness of netting for Kentucky bluegrass and this technique is now widely accepted. With Kentucky bluegrass, production time is greatly reduced since harvesting can be done as soon as shoot quality is adequate.

Recently, Burns[2] and Carrow and Sills[3] demonstrated that tall fescue sod production by this technique is feasible. Carrow and Sills[3] used VEXAR Garden Utility Net (E.I. duPont de Nemours and Co.) with a 2 x 2 cm mesh laid on the soil surface. Tall fescue was seeded at 4 lbs. seed per 1000 sq. ft. in both fall (Table 1) and spring (Table 2) seeded studies. The fall seeded tall fescue exhibited sufficient quality to harvest by 9 months (May), while the spring seeded area was ready for cutting in 4.5 months (August). In both studies, visual quality was somewhat better for plots containing netting. This response may have been due to seed washing during heavy rains which occurred in the no-net plots.

Sod tensile strength was 5 to 6 times greater for the fescue sod containing netting. Without netting, tall fescue sod was difficult to handle; with netting, its handling properties were excellent.

Transplant sod quality data refers to the visual quality of the turf at one month after transplanting. Netted plots exhibited somewhat better quality, probably due to a better quality at the time of harvesting. Transplant sod rooting indicates the ability of tall fescue to reroot after harvesting and transplanting. No differences were observed between netted and no-net plots which would indicate that the netting does not interfere with rooting after transplanting.

In a third investigation, seeding rate, nitrogen rate, and time of nitrogen application were stud-

ied (Table 3). The 8 lb. seed per 1000 sq. ft. rate resulted in better quality turf due to higher shoot density and uniformity. Also, sod tensile strength was improved. However, quality and sod tensile strengths were acceptable at the 4 lb. seeding level.

By May 1, individual plants were noted to be smaller and less vigorous at the 8 lb. seeding rate. Increased competition between plants may account for the higher incidence of *Helminthosporium* leaf spot. At the 8 lb. seeding rate, the

Continues on page 35

Table 1. Fall seeded (Aug. 30, 1977) netting study on tall fescue.

Netting treatment	Quality rating[z] Weeks after seeding 7	10	37	41	Sod tensile strength[y] (lb)	Transplant sod quality rating[z]	Transplant sod rooting[x] (lb)
Net	6.8	6.8	7.3	7.8	68	5.7	119
No Net	6.3	6.2	6.4	7.5	13	5.0	107
LSD (5%) =	0.4	0.4	0.4	0.3	6	0.6	NS

[z] Visual quality rating: 9 = ideal, 1 = no live turf.
[y] Force necessary to break a 12 inch wide strip of sod.
[x] Force necessary to separate an 11 x 11 inch sod piece from the soil by vertical lifting.

Table 2. Spring seeded (March 29, 1978) netting study on tall fescue.

Netting treatment	Quality rating[z] Weeks after seeding 10	13	19	Sod tensile strength[y] (lb)	Transplant sod rooting[x] (lb)
Net	7.0	7.2	7.4	67	95
No Net	6.5	6.5	6.9	11	90
LSD (5%) =	0.5	0.5	NS	3	NS

[z] Visual quality rating: 9 = ideal, 1 = no live turf.
[y] Force necessary to break a 12 inch wide strip of sod.
[x] Force necessary to separate an 11 x 11 inch sod piece from the soil by vertical lifting.

Table 3. Effects of seeding rate, nitrogen rate, and nitrogen application date on fall seeded (Aug. 29, 1978) tall fescue using netting.

Treatment	Quality rating[y], 1979 Apr 4	May 1	June 7	July 3	Leaf[x] spot rating May 9	Turf cover (%)	Sod tensile strength (lb)
Seeding rate (lb/1000 ft²)							
4	5.0	5.7	6.7	7.4	1.6	87	91
8	6.6	6.1	7.1	7.6	2.2	93	106
N rate (lb/100 ft²)							
1.5	5.8	5.8	6.6	7.4	2.0	88	97
3.0	5.8	6.0	7.2	7.6	1.9	91	101
Application date[z]							
Sept, Oct	5.4	5.5	6.7	7.3	1.8	88	94
Sept, Nov	6.0	6.0	6.7	7.5	2.4	88	104
Sept, Mar	6.5	5.7	6.7	7.5	2.0	88	91
Sept, Apr	6.5	6.3	7.5	7.6	1.5	95	106
LSD (5%) (seed rate) =	0.9	0.8	NS	NS	0.5	5.6	4
(N — rate) =	NS	NS	NS	NS	NS	NS	NS
(App. time) =	NS	0.6	NS	NS	NS	NS	NS

Interactions were not significant.

[z] Nitrogen application was split equally between dates.
[y] Visual quality rating: 9 = ideal, 1 = no live turf.
[x] *Helminthosporium* spp. leaf spot scale: 0 = none, 2 = moderate, 5 = severe, with 75% or more leaves with lesions.
[w] Sod tensile strength taken on July 11. Force necessary to separate a 28 x 28 cm sod piece from the soil by vertical lifting.

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Netting *from page 33*

turf was very dense and tended to lift the netting from the soil. These factors would suggest that a seeding rate of about 6 lb. seed per 1000 sq. ft. and a coarser mesh netting may be beneficial for tall fescue sod production.

Nitrogen rate did not significantly influence any of the factors measured. The application program of September-April tended to exhibit the best visual quality. This would suggest that for a fall seeded tall fescue, nitrogen in the spring should be considered, especially if the sod is to be harvested in late spring.

Possible Production Problems

Since most sod producers are not familiar with tall fescue sod production, they should consider the possible problems that may occur. In the previous section we alluded to potential problems; (a) high seeding rates may result in excessive competition, (b) a dense stand may lift the netting if it is not buried or is too fine of mesh.

Equipment is commercially available to bury netting during the seeding operation. Burying should be considered, particularly in windy sites which are common in the Central Plains. High winds may lift the netting if it is not covered with ⅛ - ½ inch soil. The equipment should be tried out on each particular site, especially if the soil is high in clay and tends to develop clumps. Burying the netting can be difficult with such soil conditions.

Whenever netting is buried, the grower faces a problem if the crop fails. Removal of the netting is very difficult prior to working the soil for reestablishment. Disking several directions followed by deep plowing will often place it deep enough for reestablishment. However, deep cultivation should be avoided in the future.

Another factor which should be considered is the cutting depth for tall fescue sod. The crown of tall fescue is quite large compared to Kentucky bluegrass. Sod cutting depth must be below the lower crown region since cutting the crown will prevent root establishment. Also, cutting depth must be sufficient to be below the netting. In general, tall fescue will require a somewhat deeper cutting depth compared to Kentucky bluegrass.

Tall fescue is not as low temperature tolerant as Kentucky bluegrass and hence a greater possibility of low temperature kill exists. Normally, a tall fescue, which has sufficient time to become winter hardy will not be injured. Sod growers should avoid late fall seedings, excessive nitrogen fertilization, and over-irrigation on fall seeded stands.

In the Central Plains region, *Helminthosporium* leaf spot injury has periodically been observed on tall fescue. This is normally not a problem on mature plants but may occur in the late fall and spring periods and newly seeded sites. Avoiding high seeding rates and excessive nitrogen will minimize this problem.

Growers must adjust their mowing program to tall fescue. The late spring period is especially important. During this time, tall fescue produces a seed head which grows very rapidly. Care must be taken to maintain an adequate mowing frequency. Research is presently underway at Kansas State University to explore the possibility for utilizing growth regulators on tall fescue during the spring period to reduce seed head production and mowing frequency.

Beard[1] noted that weed control is very important when using netting. Since sod production time is greatly reduced with netting, weeds must be eliminated or prevented by the proper use of herbicides. Preemergence annual grass control and broadleaf weed suppression in the young tall fescue stands would be of primary concern. If weeds are allowed to develop, the sod must be held longer in order for the openings to fill in. This is especially important on a bunch-type turf, such as tall fescue, since it does not have rhizomes or stolons to quickly fill in open spots.

Slower sod transplant rate is likely with tall fescue.

When transplanting a tall fescue sod, care should be taken to insure good transplant rooting. Since tall fescue does not have long rhizomes, root growth must be primarily from root initiation at the crown. This fact, in conjunction with a deeper cut sod, can result in a slower sod transplant establishment rate compared to Kentucky bluegrass.

While there are several potential production problems, these can be overcome with proper management. With the introduction of improved tall fescue cultivars, the potential for much greater utilization is present. Growers may wish to explore this market. **WTT**

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MODERN ENGINES ARE GEARED FOR LONG WEAR AND FUEL EFFICIENCY

By Ruth E. Messinger, Contributing Editor

As the longevity of tree and lawn care equipment becomes an economic necessity to Green Industry businessmen, engine quality assumes major importance. Not only reliability, but durability, ease of maintenance, fuel costs, and availability of replacement parts are factors to weigh carefully before making an initial investment.

The demand for diesel engines, with their lower fuel consumption, has been growing recently. Some gasoline engine manufacturers have added diesel engines to their regular lines.

"Diesel is the way to go in the future," says Ken Lorch of Onan Corporation. "Diesel engines last longer, they are easier to maintain, and they do heavy duty and maintain better fuel economy."

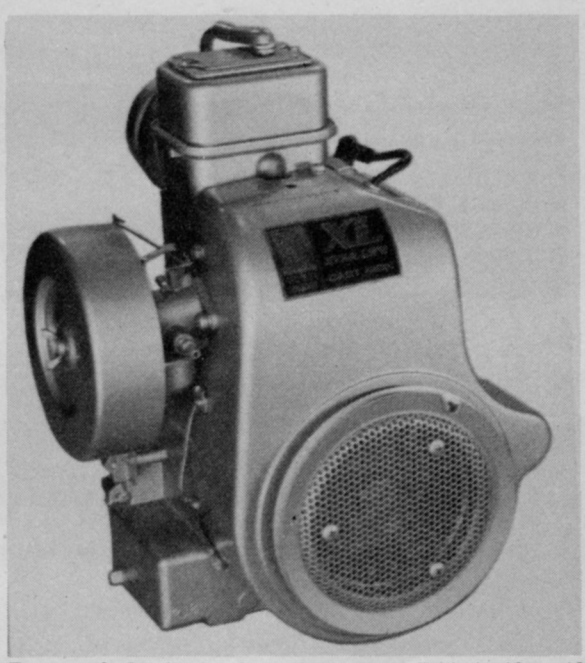
"Fuel in diesel consumption is one-half that of gasoline," says Orville McDonner, vice president of research and development of Bunton & Goodall. The company uses a Teledyne Wisconsin diesel engine on one of its tractors. "Diesel has a longer life span than gasoline, requires less maintenance."

Kohler Company's John Clark, vice president of engineering, Gravely Division, disagrees. "The smaller diesel engines really require more care and maintenance than gasoline engines and are not as forgiving of dirt," he says. "We see a demand for diesel, but we have not taken much action yet. We were thinking of it for Europe, but recently the demand for it disappeared there, because the price of diesel caught up with the price of gasoline. A number of big commercial operators with big tractors demand diesel on smaller machines so they don't have to handle two kinds of fuel. We may consider it in the future."

"For every forty-two gallon barrels of oil that are taken from the ground," says Briggs & Stratton's Executive Vice President, L. W. Dewey, "thirteen are made into gasoline and eight into diesel fuel. When more diesel goes on the market, it will cost just as much as gasoline." Briggs & Stratton is developing a diesel engine which it expects to introduce in two or three years.

Manufacturers of both gasoline and diesel models are assuring long engine life with rugged construction, protection for tough wear areas, and fewer major moving parts.

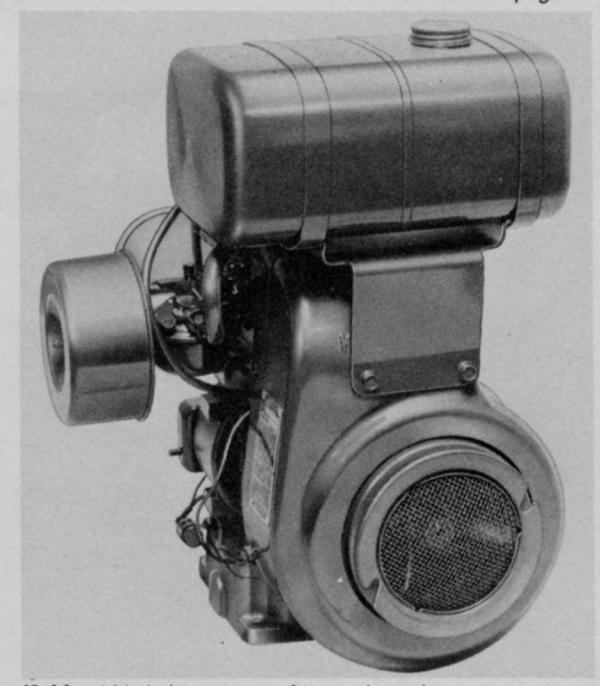
Among the new gasoline engines is Tecumseh's (301) 1000-hour, four-horsepower engine for heavy-duty rotary mowers. Its cast-iron cylinder liner lengthens cylinder life. The cast-iron bore is made to show less wear and retain better oil control. And the Stellite-faced exhaust valve and seat provide good sealing for extended service. Like other models in the TVS system, it features rustproof fuel tanks with integral-filter screen.



Tecumseh OH four-cycle engines are available in 12 to 18 horsepower.

Tecumseh also offers a line of snow-throwing engines, from two-cycle models for lightweight equipment through big power models for larger, two-state drift busters with 7, 8, and 10 horsepower.

Continues on page 40



Kohler 141 six-horsepower, four-cycle engine.

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DOW

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Kohler (302) has added a trio of two-cylinder gasoline engines with 17, 19, and 21 horsepower suitable for lawn and garden equipment. The heavy-duty, air-cooled engines have rugged cast-iron components. All are four-cycle models, and many parts are interchangeable in the series.

Each engine has an opposed cylinder design with cast-iron cylinder barrels. The crankshaft on the 17-horsepower model is made of ductile iron, and the others are of forged steel. Each engine also has an automotive-type oil pump, a replaceable dry-type air cleaner, and high carbon steel intake valves.

"We've styled these engines for easy servicing," says J. O. Kohl, director of customer service. "The cylinder barrels are removable and breaker points, condenser, spark plugs, and dipstick are all on top of the engine for easy access."

The entire Kohler line includes one- and two-cylinder models ranging from 4 to 23 horsepower. "We are going into the twin cylinder engine in the 16 horsepower and above," says John Clark.

Briggs & Stratton (303) engines for lawn and garden care include 3-, 3½-, 4-, and 5-horsepower lawnmower models. They are available

Briggs & Stratton five-horsepower, four-cycle engine.

with an automatic compression release Easy Spin starter or an optional ignition key type, 12-volt electric starter with rechargeable battery pack. An automatic choke provides metered fuel to meet any load without priming or manual adjustments.

This company also offers four-cycle tiller engines of 16 and 18 horsepower that eliminate fuel-line breakage or clogging through carburetor/fuel tank integration. The air cleaner is located away from heavy dust and dirt areas.

Briggs & Stratton's drift busters, the two- and four-cycle Sno/Gard engines, feature ultra-high torque and are available with 3 to 11 horsepower. The 3-horsepower 102 cc two-cycle model has a 6.2 cubic-inch displacement for lightweight portability and power. The four-cycle is available with 4, 5, 7, 8, or 11 horsepower. All are weather-shielded to block snow and moisture from cooling air intake, carburetor and governor, starter clutch, and spark plugs. Their ceramic magneto ignition produces high voltage at starting speeds.

Twin engines in 16 and 18 horsepower are designed to handle rugged jobs with smoothness. Cast-iron sleeves and ball bearings are standard on the 18-horsepower horizontal crankshaft engine and optional on the 16-horsepower horizontal crankshaft model.

Kawasaki's (304) four-cycle, air-cooled gasoline engines have a range from 3.4 to 20 horsepower. Model KF53DS with a 4.7 horse-

Kawasaki 6.4-horsepower, four-cycle KF 64 engine.

power has a bore of 2.59 inches (66 mm) and a stroke of 2.09 inches (53 mm). The 20-horsepower Model KF200DS has a bore and stroke of 85 x 70 mm (3.35 x 2.76 inches) and lubrication is force-fed by trochoid pump.

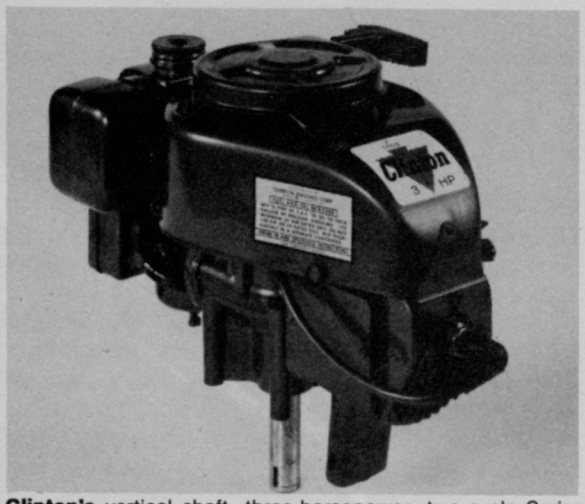
Onan (305) manufactures one-, two-, and four-cylinder air- and water-cooled gasoline engines with 12.9 to 25 horsepower and a line of heavy-duty, air- and water-cooled diesel-powered engines with 7.2 to 40 horsepower.

The two-cylinder B Series gasoline engines, which operate best between 2600 and 3600 rpm, are for use where light weight and low noise are needed. Their crankcases are made of die-cast aluminum to minimize heat build-up around the exhaust valve seats and cylinder bores. The crankshafts are of ductile iron with hardened journals.

The Onan CCK Series engines operate best in open air applications, where speed variations are short and wide (1800 to 4000 rpm). Each model has an air cleaner with replaceable dry element, a lube oil pump, an oil level indicator, a mechanical fuel pump, a manual choke, and twin mufflers with exhaust connectors.

Model T260G, with its 24 bhp (flywheel or brake horsepower), is recommended for both variable speed and continuous duty. It includes an electric starter, a mechanical flyball governor, a replaceable dry-element, two-stage air cleaner, and a spin-on, full-flow lube oil filter.

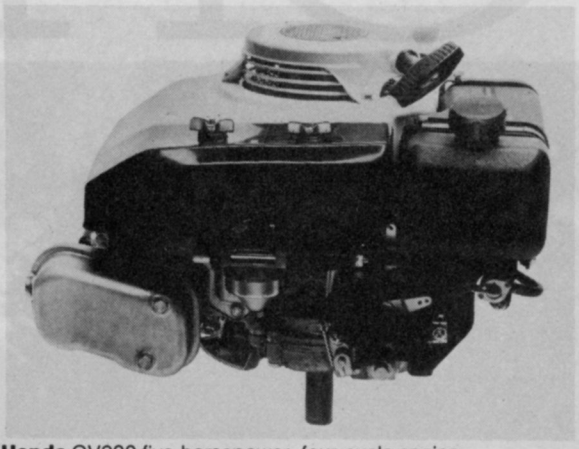
Clinton Engines Corporation (306) produces 16 basic engines, used principally on power lawnmowers with 2½ to 10.3 horsepower. These engines are available in two- and four-cycle designs, with horizontal and vertical crankshaft.



Clinton's vertical shaft, three-horsepower, two-cycle Series 501 engine.

The 500 and 501 series comprise several single-cylinder, two-cycled models with 3 horsepower. The 500 model has a bore of 2⅛ inches and a stroke of 1⅝ inches. The 501 has a bore of 2⅛ inches and a stroke of 1⅝ inches. Both are air-cooled and their piston displacement is 5.76 cubic inches. The 4.5-horsepower, four-cycle Series 498 engines are suitable for tillers and made of cast-iron alloy. They have a bore of 2-15/32 inches, a stroke of 2⅛ inches, and a piston displacement of 10.2 cubic inches.

American Honda Company (307) offers a new 5-horsepower vertical engine (GV200) for lawn and garden equipment which includes several features for durability. The top ring is hard-chrome-plated, the cylinder sleeve and valve guides are cast iron, and a trochoid oil pump provides positive lubrication. This model also has a dual-element air cleaner for higher efficiency, and a one-piece crankshaft which is hot-forged and heat-treated with ball bearings at both ends.



Honda GV200 five-horsepower, four-cycle engine.

The oil ring of the GV200 is a three-piece combination type, a design which has proved to reduce oil consumption. And the mechanical governor and fixed jet carburetor insure a consistently even fuel/air mixture and a stable output at both high and low speeds.

A single-cylinder, four-stroke engine from American Honda, the G-100, is currently being used to power its edgers. This two-horsepower, forced-air-cooled engine has a .36 gallon fuel tank that supplies power for approximately two hours. Piston displacement is 76 cc (4.6 cubic inches); bore and stroke are 46 mm x 46 mm (1.8 inches x 1.8 inches).

Teledyne Wisconsin Motor (308) offers air-cooled Robin gasoline engines in the 3 to 16.8 horsepower range. Two new single-cylinder, four-cycle models, W1-1340 and W1-1390, are equipped with heavy cast-iron cylinder liners and cast-iron camshafts with induction-hardened lobes.

Model W1-1340 is rated at 9 horsepower at 3600 rpm. It has a displacement of 20.4 cubic inches (334 cc), a bore of 3.07 inches (78 mm), and a stroke of 2.76 inches (70 mm).

Model W1-1390 is rated at 11 horsepower, also at 3600 rpm. Its displacement is 23.7 cubic inches (38 cc), with a bore of 3.307 inches (84 mm) and a stroke of 2.76 inches (70 mm).

A group of V-type, air-cooled engines from Teledyne Wisconsin is suitable for use with natural gas, gasohol, and even alcohol on special order. The two-cylinder, 25 horsepower model W2-1230 has a displacement of 75 cubic inches (1230 cc), and the four-cylinder 50 horsepower model W4-2460 has a 150-cubic-inch displacement. Both models have a 3.75-inch bore x 3.4-inch stroke, with a 6.8:1 compression ratio. They are available with an optional flywheel alternator rated 30 amperes at 12 volts.

Continues on page 44

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Engines *from page 41*

Distributor ignition and 12-volt electric start are standard on these V-type models. Inlet valves are made of Austenitic steel, and exhaust valves are of long-life, heat-resistant alloy. Positive-type valve rotators on the exhaust valves reduce the possibility of valve burning and contribute to longer valve life. Other standard features are a dry-type replaceable element air cleaner, mechanical diaphragm-type fuel pump, exhaust mufflers, and conveniently located fuel panel.

Teledyne Wisconsin has also introduced a new family of diesel engines. Model WD2-860 was selected by FMC Corporation to power its Bolens HT20D Diesel hydrostatic tractor, which it rates at 19.9 horsepower. This air-cooled engine is a twin-cylinder, four-cycle unit with cast-iron cylinders and forged crankshaft. It features full pressure lubrication and direct, open chamber combustion. The governor automatically presets the fuel injection pump to assure easy starting after shutdown. Automatic bleed valves eliminate air in the injection system.

Onan expects to have an L Series of diesel engines in production by the middle of this year. A two-cylinder model with 27.5 horsepower and a three-cylinder model with 41 horsepower will be ready some time in 1982.

Allis Chalmers (309) manufactures diesel engines which have cylinder heads designed with a cross flow. Because the intake and exhaust ports are located on opposite sides of the combustion chamber, both chamber and valves are cooled better. And with the combustion chamber actually in the piston head, there is a highly turbulent, swirling air mass at the time of injection, resulting in a more complete burning of fuel.

Model 213 delivers 27 horsepower at 3000 rpm for continuous-duty operation and is suitable for irrigating a lawn. Model 320 runs on 40 horsepower at the same rate.

How do gasoline and diesel engines compare in an actual performance test? Guido Gallioli, marketing manager for the Teledyne Wisconsin diesel, says, "We ran a comparison test between the 18.2-horsepower gasoline and 19 horsepower diesel. The initial additional cost of the diesel is offset in about 650 hours. After that, the use of a diesel becomes more economical in cost of fuel. Maintenance and tune-ups are fewer because diesel does not have electrical components. The injection pump is more precision-built than the carburetor and doesn't have to be adjusted — it stays tuned longer. The average life is at least double with the heavy-duty gasoline model. With the light-duty type, it's ten times longer. As a rule of thumb, the diesel makes sense economically for somebody who runs the equipment commercially or industrially."

Once the proper engine has been selected, it is

Continues on page 54

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MAGNOLIA CULTIVARS FLOWER FROM APRIL THROUGH SUMMER

By Douglas J. Chapman, Horticulturist, Dow Gardens, Midland, Michigan

If one large shrub or small tree represents a herald of spring, it certainly is magnolia. Magnolias commence blooming in mid-April and continue through June. They are useful as specimens, foundation planting, or for large area landscapes. The outstanding magnolias include Lily, Saucer, Star, 'Dr. Merrill,' and Sweetbay.

Lily Magnolia *(Magnolia quinquepeta* — formerly *M. liliflora)* is a multiple-stemmed, large shrub or small tree, with a round habit, reaching 10 to 14 feet in height. The 3- to 4-inch leaves are dark green on the upper surface with a light green beneath, giving a shimmering effect on a windy day. Fall color is non-existent. This native of China is perfectly hardy as far north as Detroit. It flowers during mid-May, just after X *M. soulangiana.* The delicate flowers are the prominent characteristic. The fine texture, pointed petals are unique, having dark purple exterior and white interior. It grows best in semi-sun and integrates well as a specimen, in beds, or with ground cover. The soil should have a pH of 5.5 to 6.5, be moist yet well-drained, and high in organic matter, since magnolia is rather shallow rooted.

Saucer Magnolia (X *Magnolia soulangiana)* can be a single stem or multiple stem tree, 20 to 30 feet in height, with a round habit, holding branches clear to the ground. The coarse leaves are 4 to 6 inches in length, being a flat green during summer and a shiny brown late in the fall. This fall color is extremely effective. The smooth gray bark, almost beech-like, is an outstanding winter characteristic. Saucer Magnolia flowers in central Michigan during early May. The purple buds are outstanding, but when the plant comes into full flower, the petals fall rapidly. The most effective time for the flowers is during bud — not when fully open. Saucer Magnolia prefers soil which is well drained, fertile, and high in organic matter with a pH ranging from 5.5 to 7. It should be moved early spring, before flowering, for most successful transplanting. Saucer Magnolia is an outstanding specimen tree for use in the home landscape or on commercial grounds. It should be noted that if planted in a lawn, the branches should be left clear to the ground as grass can be too competitive for this fleshy root system. Further, the grass will not thrive well in

Continues on page 48

Dr. Merrill Magnolia flowers in late April and grows rapidly to 30 feet high. It makes an excellent specimen in single or multi-stem forms.

Sweetbay Magnolia flowers in mid-June through much of the summer and is native from Florida to Massachusetts.

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Magnolia *from page 46*

the dense shade produced by the magnolia. The cultivars of Saucer Magnolia are most spectacular as they flower one to two weeks later and usually have fruit which, as it turns red, can be quite effective during the fall months. X *M. soulangiana* 'Alba' ('Superba') is a compact tree form with white flowers. These white flowers have a light purplish tinge in bud but are almost pure white in full flower. X *M. soulangiana* 'Lennei' is the outstanding purple variety. It not only holds its petals over a long period of time but has purple to magenta flowers on the interior and exterior of the petal, making it unique among the magnolias.

'Dr. Merrill' Magnolia (X *Magnolia loebneri* 'Dr. Merrill'), a hybrid between *M. stellata* x *M. kobus*, is intermediate in flowering between Star and Saucer Magnolia. In Central Michigan, it is usually in full flower during the last week of April. It is a rapid growing small tree that can reach 30 to 35 feet in height. It is an outstanding specimen plant in large area landscapes or for the home grounds. Although it can be in multiple-stem forms, it is most spectacular as a single stem tree since it holds a good central leader. The fragrant white flowers are truly spectacular with white petals (pink outer surface). The semi-upright habit gives one an opportunity of planting ground cover beneath or simply mulching heavily.

Star Magnolia *(Magnolia stellata)* is the earliest herald of spring. Michigan can dependably expect Star Magnolia to be in full flower during the second or third weeks of April. It is a small shrub, usually multiple-stemmed, reaching 10 to 15 feet in height with a similar spread. It is a slow growing, dense plant, making it outstanding as a specimen, shrub, or in mass plantings. The foliage is dark green in summer, becoming yellowish to bronze in the fall. This fall color is not nearly as effective though as is X *M. soulangiana.* Flowers are a double white, 3 inches in diameter, with at least 12 to 15 petals. The species flowers are a good clear white, being equally effective in full flower and bud. The most outstanding cultivar is the 'Rosea' form of Star Magnolia which is quite pink in bud, fading to a light pink at full flower. Star Magnolia, as with many magnolias, transplants best before flowering. This shrub is perfectly hardy as far north as central Michigan.

Sweetbay Magnolia *(Magnolia virginiana)* is a 10- to 20-foot tree in the north and can reach in excess of 60 feet in the south. Although often found as a multiple-stemmed tree or shrub in the north, its upright spreading habit is quite treelike in the south. The upper side of the foliage is a lustrous dark green throughout the summer and a grayish glaucous on the under surface. This gives a shimmering aspen-like effect on a windy day. The 3- to 5-inch long, somewhat pointed, oval leaves give this magnolia a rather fine texture. It is outstanding as a specimen tree in small area or commercial landscapes. Its gracefully spreading habit is outstanding during the winter. The bark of the twig is green. Sweetbay Magnolia flowers during the summer. It usually starts flowering during mid-June. It is not uncommon to see flower buds, partially opened, in full bloom, and fruit formed on the same plant at the same time. This not only extends the period of bloom, it makes this plant truly a unique addition to the summer landscape. The flowers are creamy-white, lemon-scented, 2 to 3 inches in diameter, with 9 to 12 petals. It is native from Massachusetts to Florida and is perfectly hardy in protected sites as far north as central Michigan.

Magnolia, a herald of spring, is susceptible to many insects and diseases but rarely is damaged by any. It can be pruned early spring. It is effective as a flowering shrub (Star Magnolia) or tree (Saucer or Sweetbay Magnolia). The flowering periods are as follows: Star Magnolia — mid-April; 'Dr. Merrill' Magnolia — third week of April; Saucer Magnolia — mid-May; Lily Magnolia — third week of May; and Sweetbay Magnolia — throughout June. **WTT**

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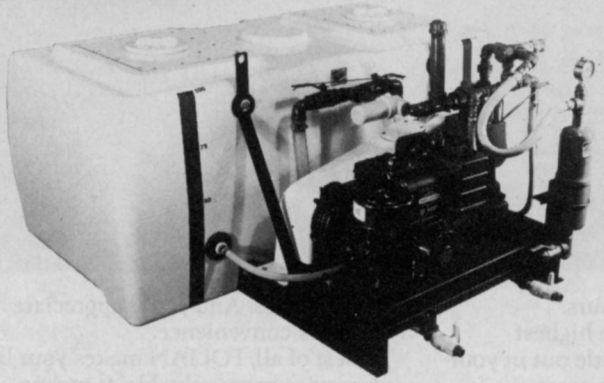

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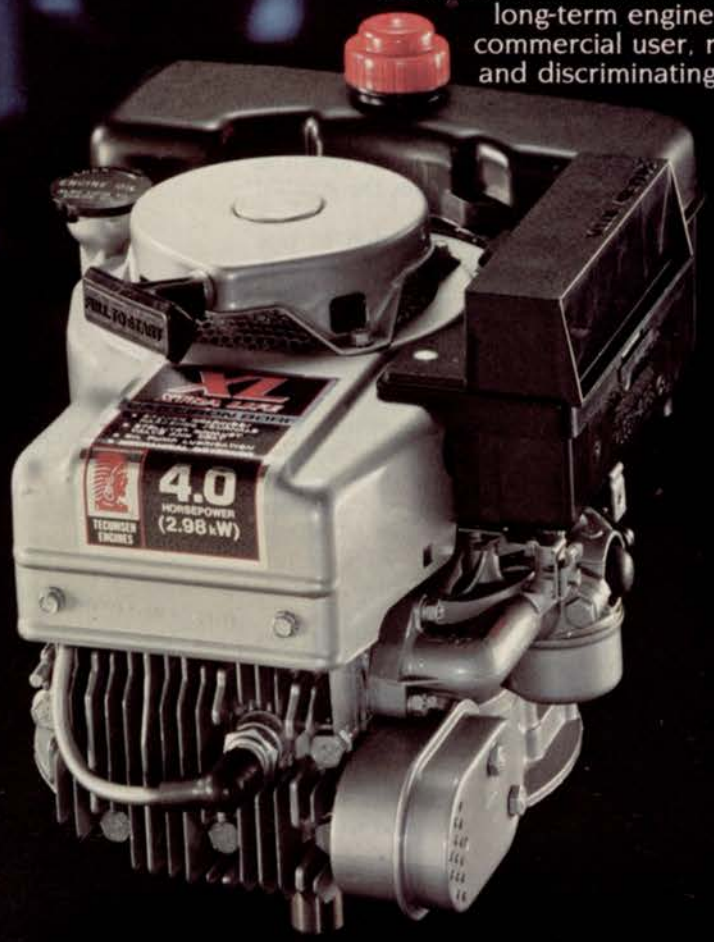


TECUMSEH PRODUCTS COMPANY — ENGINE DIVISIONS
GRAFTON and NEW HOLSTEIN, WISCONSIN

VEGETATION MANAGEMENT

By Roger Funk, Ph.D., Davey Tree Expert Co., Kent, Ohio

Q: *Much is being reported lately on the advantages of late fall fertilization. I have read that as much as two-thirds of the year's nitrogen should be applied during this period. At the same time, there are warnings to the effect that nitrogen late in the season may be undesirable by forcing top growth when the grass plants should be storing carbohydrates and developing root systems.*

Please explain this seeming conflict. What is considered late fall timing here, and what fertilizer analysis do you recommend for this application? (Ohio)

A: The apparent contradictions are due, in part, to a failure in the literature to distinguish between fall and late fall fertilization, and between late fall and winter fertilization. The time period for each is not always clear since it can vary from one area of the country to another and even from one year to the next. The distinction is important, however, in predicting turfgrass response to fertilization since cool-season turfgrasses have a distinct seasonal cycle of growth, primarily the result of seasonal changes in temperature, day length, and light intensity.

SPRING — Maximum root growth of cool-season turfgrasses occurs in early spring before top growth (spring greenup) is evident. Later in the spring, top growth increases while root growth declines.

SUMMER — Both top and root growth slow during summer, and surface roots may be killed. Although the emergence of rhizomes is less seasonal-specific, Kentucky bluegrass reportedly produces the greatest number during the summer.

FALL — Top growth is again stimulated in late summer-early fall. As top growth slows in late fall, roots begin actively growing and continue growth at a decreasing rate until the soil temperature approaches freezing.

An extensive root system and vigorous but not excessive top growth are important objectives in maintaining good quality turfgrass. Because of the cyclic growth of cool-season turfgrasses, fertilizer applied before top growth is initiated in the spring or after top growth slows in the fall will stimulate root development without a correspondingly large gain in foliage. Top growth that occurs as a result of late fall fertilization is mainly in the form of new tillers that remain compact until spring.

Late fall fertilization roughly coincides with the last regular mowing of the season as the turfgrasses begin their hardening-off process to cold temperatures. In Ohio, this usually occurs in late October-early November. Excess nitrogen during this period has reportedly reduced cold resistance and enhanced turfgrass susceptibility to snow molds although I am not aware of any field data that demonstrates increased winter injury.

Concerning the appropriate analysis and application rate, many researchers suggest nitrogen alone at a rate of one to two pounds per 1000 square feet in a soluble form such as urea. The advisability of including potassium or phosphorus can be determined only through future testing. We are currently conducting research to compare the results of late fertilization with other fertilization schedules and to determine the feasibility of including late fall fertilization in our program.

Q: *Recommendations for insecticides are usually given for 100 gallons of solution. We do some of our spraying with a backpack and spend a lot of time trying to determine the right amount of material to use. Is there a chart available or some easier way to reduce the recommendations to a gallon of solution?*

A: The measurements given below are approximate and should be used as a guideline only if the directions for mixing small quantities are not given on the label.

LIQUID MEASURE:

Amount per 100 gallons	Amount per gallon
1/4 pint	1/4 teaspoon
1 pint	1 teaspoon
1 quart	2 teaspoons
1 gallon	2-1/2 tablespoons
2 gallons	5 tablespoons
4 gallons	1/3 pint
11 gallons	7/8 pint

DRY WEIGHT

Amount per 100 gallons	Amount per gallon
1/2 pound	1/12 ounce
1 pound	1/6 ounce
2 pounds	1/3 ounce
3 pounds	1/2 ounce
4 pounds	2/3 ounce
6 pounds	4/5 ounce
16 pounds	2-3/5 ounces
20 pounds	3-1/5 ounces

Q: *What is the name of the material which can be used to prevent wood from checking?*

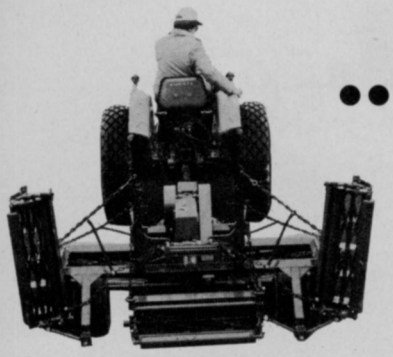
A: The product is polyethylene glycol (PEG). The latest information we have is that it is available through Dow Chemical Company, P. O. Box 1592, Midland, Michigan 48640; and Union Carbide Company, Park Avenue, New York, New York 10017.

Additional information may be available from Forest Products Laboratory, P. O. Box 5130, Madison, Wisconsin 53705.

Note: In response to the question on the availability of Krilium published in Vegetation Management, December 1980, I received the following information:

Mitchell Seed and Grain Company, located in Roswell, New Mexico, has several drums of Krilium purchased at the time that Monsanto phased out the product. If you are interested, contact that company direct for further information.

Send your questions or comments to: Vegetation Management c/o WEEDS TREES & TURF, 757 Third Avenue, New York, NY 10017. Leave at least two months for Roger Funk's response in this column.



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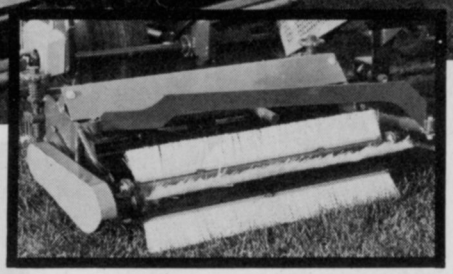

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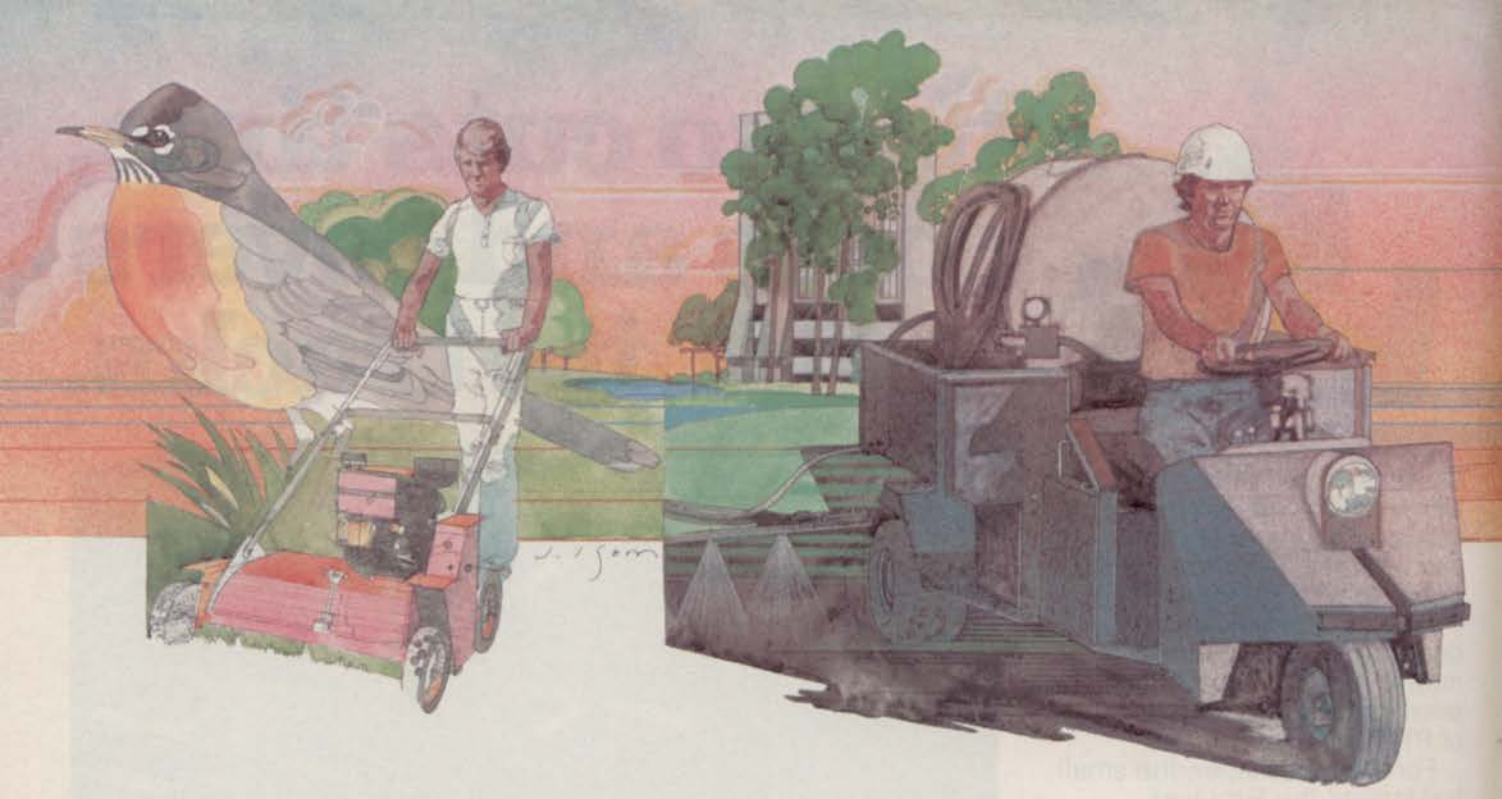

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Rugby is a new Kentucky bluegrass. But it's not unproven. Before it was ready to be introduced to you, years of extensive testing were performed under a broad range of climatic and soil conditions. Test sites were located not only in the United States, but Canada as well.

The results? Our testing has shown Rugby to be unique. It's a truly *different* variety from anything else on the market, with superior performance.

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The most singular advantage of Rugby is its ability to provide high-quality dark green turf when maintained at *low* nitrogen fertility and restricted moisture levels.

Most improved Kentucky bluegrass varieties are *not* low-fertility types. You may be told they performed well in turf trials. Unfortunately, you're *not* told that those trials are often conducted using *optimum* nitrogen levels. So it's no wonder you have to fertilize the heck out of these varieties to get good results.

Not so with Rugby. *You can actually get better results with Rugby than with other Kentucky bluegrass varieties while using less nitrogen fertilizer.*

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But no matter how much we tell you about the low-maintenance aspects of Rugby, ultimately you look for – and demand – *superior turf.* Your professional standards wouldn't settle for anything less. And we wouldn't want it any other way.

Rugby has a rapid spring green-up rate and excellent fall color. And it also displays *sustained growth during the mid-summer heat stress period,* even under low nitrogen fertility and restricted moisture.

Moreover, Rugby possesses a high level of resistance to most of the common and current turfgrass diseases. This is another factor which may well result in significant savings in turf management costs.

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Using less water and fertilizer means potential dollar savings for you, of course. But you can also take satisfaction in the fact you'll be using *fewer natural resources.*

By now you're well aware of the increasing social consciousness among the population in this regard. And by making available a Kentucky bluegrass that fits the world of the '80's, we believe we're fulfilling an important need.

For more information on Rugby, write Rugby Kentucky Bluegrass, P.O. Box 923, Minneapolis, MN 55440.

Rugby
KENTUCKY BLUEGRASS
For low-maintenance turf

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Engines *from page 44*

important to know how it works and to understand its three basic needs — fuel-air mixture, compression, and ignition — in order to keep it running as economically as possible. Every manufacturer provides owner and service manuals for its engines which should be followed carefully.

A failed engine can be easily overhauled and rarely needs to be replaced. However, P. H. Scholten, Kohler's service manager, advises in the company's "EM" (Equipment Management) publication: "Before rebuilding an air-cooled engine, a systematic analysis of the failure should be conducted to determine the cause and ascertain whether or not it was preventable."

When an engine must be completely replaced, the Hustler Corporation can interchange models on its lawn care equipment with only slight modifications, except for an 18 horsepower model. The company puts Kohler models K532 (20 horsepower) and K582 (23 horsepower) on its lawnmower models 275 and 285. It mounts a Briggs & Stratton 18-horsepower, air-cooled engine on another mower and also uses a Teledyne Continental water-cooled engine with 25 h.p.

"We basically have the same frame on all our units," says John Austin of Hustler's Service Department, "and with relocation of the motor mounts, we can pull a Kohler out and put a Continental engine in."

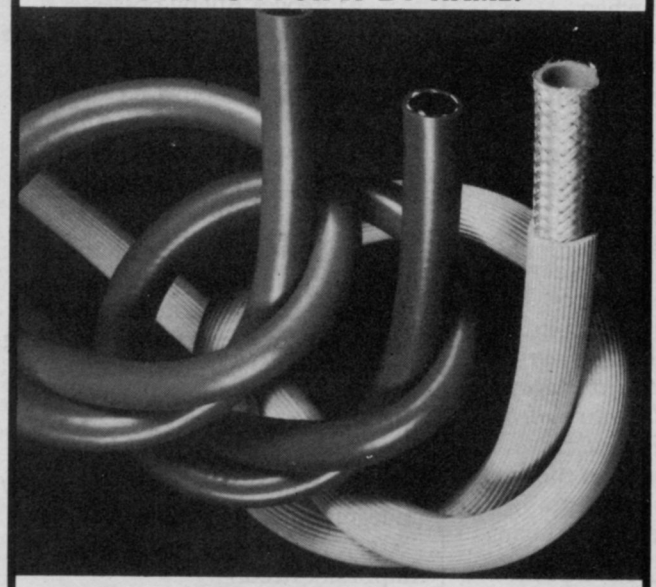
Tuflex uses Briggs & Stratton 5 and 8 horsepower and advises replacement with the same engine.

Bunton & Goodall equips its mowers with Briggs & Stratton and Tecumseh engines. The company uses a Teledyne Wisconsin diesel with 19 horsepower on one tractor and a Kohler gasoline, 20-horsepower engine on another. "You can swap some engines," says Orville McDonner. "It's about an hour's job."

Toro uses a variety of engines on its equipment, including Kohler, Chevrolet, Teledyne Continental, and Briggs & Stratton. The air-cooled are most often replaced.

"To stretch air-cooled engine life," writes P. H. Scholten, "There are only three simple rules to follow: Keep the engines clean on the outside, keep them clean on the inside, and keep them supplied with oil. Air-cooled engines are built to withstand severe punishment . . . The successful extension of air-cooled engine life depends not on how well the shop can repair them, but on how well the man using them can perform a basic inspection, and on routine service." **WTT**

NOW! ASK FOR IT BY NAME!"



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SOD PRODUCER NEWS

FLCRA changes remain top priority

An attempt of the American Sod Producers Association and the American Association of Nurserymen to change the Farm Labor Contractor Registration Act was sidetracked late last year by the refusal of the lame-duck Congress to pass a Congressional pay increase.

The Department of Labor had interpreted the FLCRA as exempting any nurseryman who personally engages in activity "for the purpose of supplying migrant workers for his own operation." The Department held that a corporation cannot "personally engage" and must therefore register as a Farm Labor Contractor.

During April, 1980, various agricultural associations met with the staff of the Senate Labor and Agricultural Committee to work out a solution to the problem. Since the groups involved did not agree unanimously, their effort was unsuccessful.

On December 3, Senator Lawton Chiles (D-Fla.) and Senator David Boren (D-Okla.) led an effort to attach an amendment to the Continuing Appropriations Resolution for fiscal year 1981 which would have prevented the Department of Labor from applying the FLCRA to sod producers and nurserymen. The bill was approved by the Senate 47 to 41.

During the same period, however, the House passed its own version of the Continuing Resolutions bill, which did not contain the FLCRA amendment but included a $10,000 salary increase for members of Congress. House and Senate conferees attempted to arrive at a compromise final bill, but a deadlock arose because of the Senate's unwillingness to agree on a pay increase. The House, in turn, did not accept any of the amendments which the Senate had attached to its Continuation Resolution, including the FLCRA amendment.

Resolution of the FLCRA problem remains a top priority goal for sod growers and nurserymen during the 97th Congress.

New Kentucky bluegrass saves on maintenance

A new, improved Kentucky bluegrass called "Rugby" offers potential savings in fertilizing, watering, and mowing costs. Even when grown under low to moderate nitrogen fertility levels with restricted moisture, it provides a high level of turf quality.

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EVENTS

The current issue of WEEDS TREES & TURF carries meeting dates beginning with the following month. To insure that your event is included, please forward it, 90 days in advance, to: WEEDS TREES & TURF Events, 757 Third Ave., New York, NY 10017.

Tree Foreman Training program, Kent, Ohio, **June 1 - 12.** Contact Richard Abbott, Davey Environmental Services, 117 S. Water St., Kent, OH 44240, (216) 673-9511.

Plant Maintenance Seminar and Exhibit, Hofstra University, Hempstead, New York, **June 2-4.** Contact Facility Maintenance Institute, Hofstra University, Hempstead, NY, 11550, (516) 560-3315.

Refresher Course, Cal Poly, San Luis Obispo, CA, **June 2-4.** Contact Lanny E. Walker, California Association of Nurserymen, 1419 - 21st Street, Sacramento, CA 95814, 916/448-2881.

Kentucky Cemetery Association Annual Convention, Executive Inn, Louisville, Kentucky, **June 5-7.** Contact Lewis Tingley, Resthaven Memorial Park, PO Box 18068, Louisville, KY 40218, (502) 491-5950.

Grow Show '81, Albert Thomas Convention Center, Houston, TX, **June 8-10.** Contact David H. Lindsay, Exposition Manager, P.O. Box 17413, Dulles International Airport, Washington, DC 20041, 703/471-5761.

Texas ISA chapter meeting, Dunfey Dallas Hotel, Dallas, TX, **June 11-13.** Contact Ervin C. Bundy, Executive Director, 5 Lincoln Square, P.O. Box 71, Urbana, IL 61801, 217/328-2032.

Northern Michigan Turf Managers Association meeting, Cadillac, MI, **June 16.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Seventh Annual Turf Field Day, University of Massachusetts, South Deerfield Research Station, **June 24.** Contact Dr. Joseph Troll, University of Massachusetts, Dept. of Plant and Soil Science, Stockbridge Hall, Amherst, MA 01003, 413/545-2353.

Better Lawn & Turf Institute Annual Meeting, Atlanta, GA, **June 30.** Contact Robert W. Schery, Director, BLTI, 991 W. 5th Street, Marysville, OH 43040, 513/642-1777.

Northern Michigan Turf Managers Association meeting, Cadillac, MI, **July 7.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

New York State Nurseryman's Association Convention and Trade Show, Onondaga County War Memorial Convention Center, Syracuse, NY, **July 7-10.** Contact Margaret Herbst, 230 Park Ave., New York, NY 10017, 212/685-4579.

Continues on page 58

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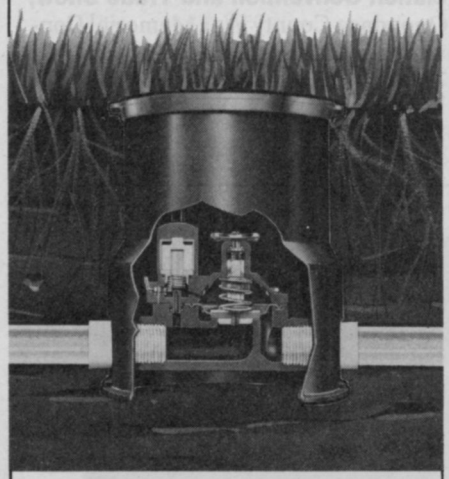

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Events *from page 57*

Grower's Seminar, San Jose, CA, **July 14.** Contact Lanny E. Walker, Public Relations Director, California Association of Nurserymen, 1419 21st Street, Sacramento, CA 95814, 916/448-2881.

American Sod Producers Association Summer Convention & Field Days, Hershey Motor Lodge & Convention Center, Hershey, PA, **July 15-17.** Contact ASPA, Bob Garey, Executive Director 9th & Minnesota, Hastings, NE 68901, 402/463-4683.

American Association of Nurserymen 106th Annual Convention and Trade Show, Stouffer's Cincinnati Towers, **July 18-22.** Contact AAN, 230 Southern Bldg., Washington, D.C., 20005.

Society of American Florists 1981 Convention, Denver, Colorado, **July 29-Aug. 1.** Contact SAF, 901 N. Washington St., Alexandria, VA 22314.

American Phytopathological Society Annual Meeting, New Orleans, **Aug. 2-6.** Contact Steven Nelson, Convention Services, APS, 3340 Pilot Knob Rd., St. Paul, MN 55121, (612) 454-7250.

Illinois Landscape Contractors Association Summer Field Day, D. Hill Nurseries, Union, Illinois, **Aug. 5.** Contact Lucille Little, 202 W. Main St., PO Box 1049, St. Charles, IL 60174, (312) 584-5770.

International Society of Arboriculture Convention, Boyne Mountain Resort, Boyne Falls, Michigan, **Aug. 9-12.** Contact E.C. Bundy, ISA, PO Box 71, 5 Lincoln Square, Urbana, IL 61801, (217) 328-2032.

International Society of Arboriculture Annual Meeting, **Aug. 9-13,** Boyne Mountain Resort, Boyne Falls, Michigan. Contact E.C. Bundy, 5 Lincoln Square, P.O. Box 71, Urbana, IL, 61801, 217/328-2832.

Sixth Nebraska Turfgrass Field Day and Equipment Show, Aug. 4. Contact Dr. Robert Shearman, University of Nebraska, 377 Plant Science Bldg., Lincoln, NE 68583, 402/472-2550.

International Garden Centre Congress, Disneyland Hotel, Anaheim, CA, **Aug. 24-30.** Contact Pat Redding, GCA, 230 Southern Bldg., Washington, DC 20005.

Grower's Tour, Aug. 25. Contact Richard Staples, Program Administra-

Continues on page 64

Embark® Plant Growth Regulator Distributor Locations

California
Moyer Chemical Co.
San Jose
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Target Chemical Co.
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Fresno
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San Jose
Los Angeles
San Diego
Wilbur-Ellis Co.
Chula Vista
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Colorado
Balcom Chemical Inc.
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Florida
Southern Agricultural Insecticides, Inc.
Palmetto

Georgia
Regal-Chemical Co.
Alpharetta

Illinois
Chicago Toro
Drake-Scruggs Equip. Inc.
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Turf Products, Ltd.
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Indiana
The Daltons Inc.
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Champion Turf Equipment
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Commercial Lawn Services Inc.
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Chesterfield
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Mountainside

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Agway Inc.
Syracuse
Green Spaces
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Superintendent
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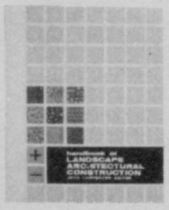

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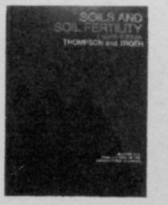

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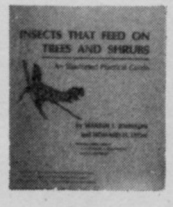

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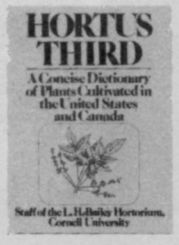

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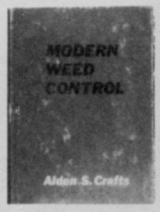

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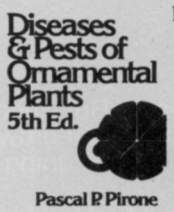

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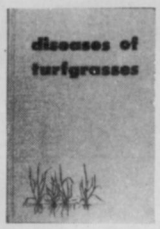

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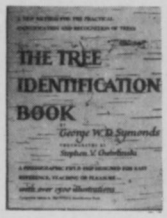

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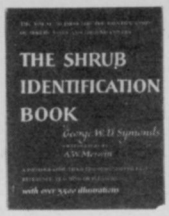

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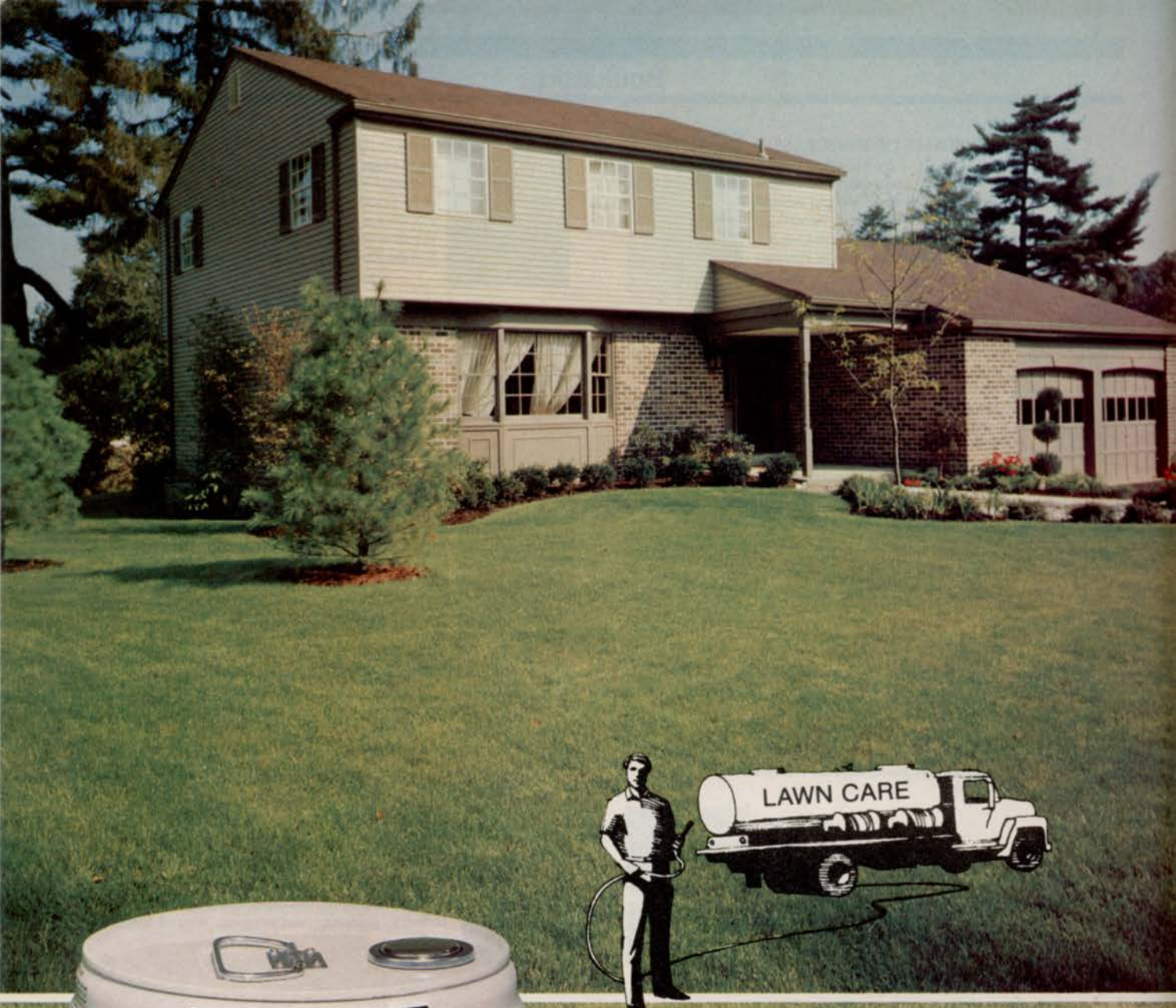

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Immaculate weed-free turf is the key to profit for the Lawn Care Operator

Read how Trimec® Turf Herbicide can help you improve the bottom line

As a lawn care operator, you live in a glass house, and this has a direct bearing on your profits. Some businesses can hide their mistakes, or shift the blame, or postpone the consequences, thus buying time to make corrections later when they're not so busy.

But not you!

If a few ugly weeds appear out of nowhere in one of your lawns, or if some trees and ornamentals show signs of damage, the finger points to you; you've got to do something right now or you may lose a customer as well as your chances for new customers in the block.

Fortunately, there's another side to the coin. If one of your lawns is as immaculate as a country club fairway, everyone in the block sees it and becomes a prospect for you.

The point is, you've got to do the job right the first time. You absolutely can't tolerate the emergence of stray weeds or damaged ornamentals.

STRAY WEEDS: The weeds that plague lawn care operators are not dandelions or chickweed or other common sensitive weeds. To the contrary, they invariably are a hard-to-kill variety usually thought to be rare — until they showed up in your customer's lawn!

Where did they come from? They're the natural consequence of using a narrow-spectrum herbicide in an area being fertilized and watered.

The hardy weeds (those not controlled by the narrow-spectrum herbicide) are nourished by the fertilizer and water, and fight with the grass to fill the vacancy left by the demise of the sensitive weeds. Some of them win, and weeds that once were obscure become prominent.

There's really only one efficient way to cope with the problem, and that is the Trimec way.

Trimec is the one turf herbicide with a broad enough spectrum to get those hard-to-kill weeds along with the common, sensitive ones. How many broadleaf weed species will Trimec control? We're still looking for the troublesome broadleaf weed that Trimec will not control when applied at the right times and rate. If we do find such a weed, we'll be very much surprised. *No other selective herbicide matches the broad spectrum of Trimec.*

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- Controls the widest range of broadleaf weeds
- Gets hard-to-kill species with one treatment.
- Wide safety margin for lawn grasses
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- Unique formula overcomes water hardness problems
- Treated areas may be reseeded within two weeks
- Non-flammable and non-corrosive in use
- Product stable several years above 32° F.
- Biodegradeable; friendly to the environment
- Bentgrass formula is also available

ORNAMENTAL DAMAGE: Any broadleaf herbicide can damage trees and ornamentals if used indiscriminately. But, for Trimec to cause such damage as a result of translocation, it would have to be applied at more than *ten times* the label recommendation. We estimate that more than 2 million lawns were sprayed with Trimec in 1980; there is not a single report of damage to trees or ornaments.

The reason why Trimec is so friendly to the environment, yet so powerful, is because no ingredient in Trimec is at a phytotoxic level.

CUSTOMER RELATIONS: Because most customer complaints and resulting service call-backs are caused by a genuine lack of information, we have designed an instructive Trimec door-hanger in response to the problem. It explains Trimec's slow, thorough action and the time required to kill a weed, root and all, using the world's most efficient herbicide.

Experience has shown this door-hanger to be highly effective in reducing the number of complaints and call-backs because it tells customers what to expect — *in advance.*

A generous supply of Trimec door-hangers is available with your Trimec purchase.

THE BOTTOM LINE: You can buy a narrow-spectrum herbicide that costs less per gallon than Trimec. But, on the bottom line, Trimec costs less than its less-effective contemporaries. That's because it requires less chemical per acre for maximum weed control; and because it saves labor by doing the job right the first time.

No matter how large or small your business, your Trimec distributor wants to help you. See him, today.

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- Lawn Grasses — Brown Patch

Terrazole for Pythium Control
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Terraclor is also registered for the control of snow mold in turf grasses in the states of Illinois, Indiana, Michigan and Minnesota.

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soil fungicide

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Events *from page 58*

tor, California Association of Nurserymen, 1419 21st Street, Sacramento, CA 95814, 916/448-2881.

University of Rhode Island Turfgrass Field Day, Kingston, RI, **Aug. 26.** Contact C.R. Skogley, University of Rhode Island, Dept. of Plant Science, Woodward Hall, Kingston, RI, 02881, 401/792-2570.

Northern Michigan Turf Managers Association meeting, Gaylord, MI, **Aug. 26.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Ornamentals Northwest Seminars, Oregon State University, Portland Memorial Coliseum Portland, OR, **Aug. 28-29.** Contact Dr. James L. Green, Oregon State University, Dept. of Horticulture, Corvallis, Oregon 97331, 503/754-3464.

Garden Industry of America Conference & Trade Show, Pittsburgh Convention/Exposition Center, Pittsburgh, PA, **Sept. 10-12.** Contact GIA, Box 1092, Minneapolis, MN 55440.

Tree Foreman Training, Kent, Ohio, **Sept. 14-25.** Contact Richard Abbott, Davey Environmental Services, 117 S. Water St., Kent, OH 44240, (216) 673-9511.

Northern Michigan Turf Managers Association meeting, Acme, MI, **Sept. 15.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

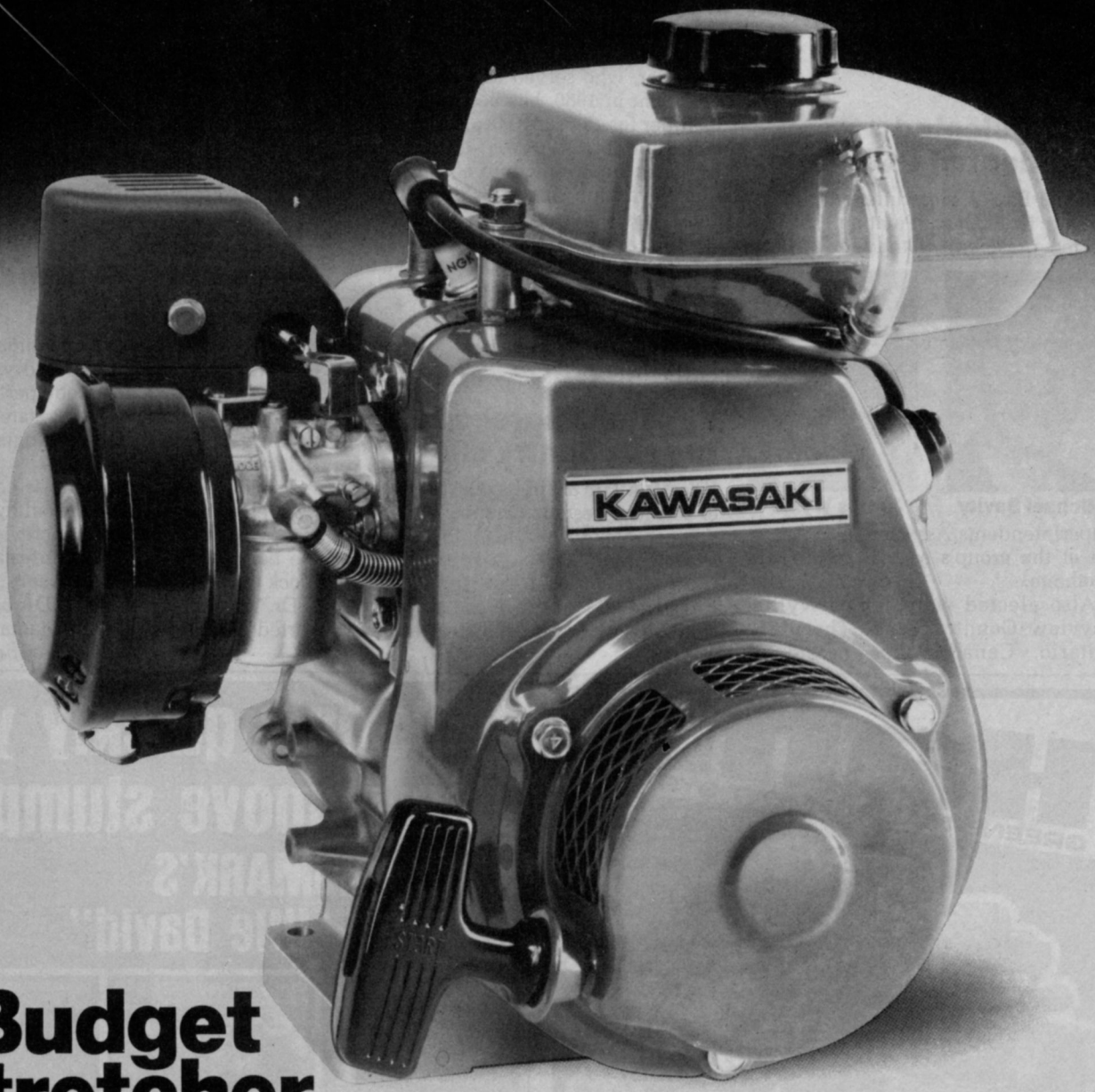
Pacific Horticultural Trade Show, Long Beach Convention Center, Long Beach, CA, **Sept. 23-25.** Contact Lanny E. Walker, California Association of Nurserymen, 1419 - 21st Street, Sacramento, CA 95814, 916/448-2881.

Northwest Turfgrass Conference, Olympia, WA, **Sept. 28-Oct. 1.** Contact Dr. Roy L. Goss, Northwest Turfgrass Association, Western Washington Research and Extension Center, Puyallup, WA 98371, 206/593-8513.

Central Coast Turf Day, California Polytechnic State University, San Luis Obispo, CA, **Oct. 1.** Contact Ronald D. Regan, Head, Ornamental Horticulture Department, CPSU, San Luis Obispo, CA 93407, 805/546-0111.

Northern Michigan Turf Managers Association meeting, Pinconning, MI, **Oct. 6.** Contact C. E. "Tuck" Tate, President, NMTMA, 1147 Santo, Traverse City, MI 49684, 616/947-9274.

Kawasaki



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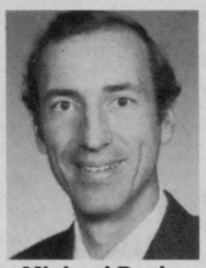
News *from page 11*

course without sacrificing the quality of play. Green sizes could be cut down as well.

GOLF

Bavier elected president of GCSAA

Michael Bavier, superintendent of Inverness Golf Club, Palatine, IL, was elected president of the Golf Course



Michael Bavier

James Wyllie

Superintendents Association of America at the group's annual meeting in Anaheim.

Also elected were James Wyllie, Bayview Country Club, Thornhill, Ontario, Canada, vice president; Eugene Baston, Birmingham (AL) Country Club, director; and Riley Stottern, Jeremy Ranch Country Club, Salt Lake City, UT.

Bavier, who served as GCSAA vice president in 1980, has been a GCSAA member for 15 years. He also served as a director of GCSAA for four years. He has been superintendent of the Inverness Golf Club since 1969, and previously was superintendent of Calumet Country Club, Homewood, IL, from 1965 to 1969. Wyllie has served as a director of the association for three years and has been a GCSAA member for 20 years.

GOLF

Firestone agrees to sell country club

Firestone Tire & Rubber Co. has agreed to sell its Firestone Country Club and golf complex in Akron, Ohio, to Akron Management Corp., a subsidiary of Club Corp. of America from Dallas. Firestone did not give the price, but said the club has been appraised at $5 million.

The company said it decided to sell the 500-acre country club and golf complex after several organizations and companies showed interest in purchasing both the North and South courses. The sale includes all land, maintenance buildings, the clubhouse, and all equipment at the club.

The country club will continue to be known as Firestone Country Club.

PEST CONTROL

Pines suffer damage from nematode

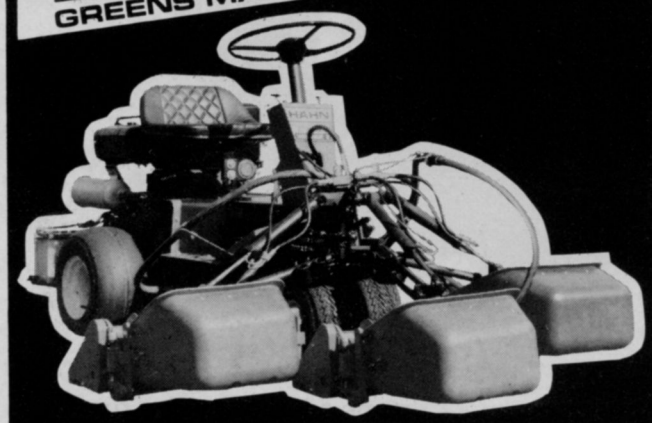
If pines didn't already have enough to tolerate with drought and a dry, cold winter, a Japanese nematode pest is attacking pines in at least 28 states, according to USDA nematologists in Beltsville, MD.

The pinewood nematode is carried by beetles from infested to healthy pine trees where it burrows into crevices in the bark of the branches. Infestations block the resin flow in the tree.

Dr. William Nickle of USDA has reported million of dollars damage to

Continues on page 69

Hahn
GREENS MANAGEMENT SYSTEM



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This powerful 16 h.p. machine with electric starter makes short work of stumps from 2 ft. above ground to 1 ft. below surface. Ruggedly reliable, it can pay for itself in a few busy weeks — according to reports from satisfied users. Try it yourself and see.

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pines in Japan over the past 30 years. Nickle warns Christmas tree farmers to be on the alert. "Periods of hot, dry weather, as we had last summer, tend to weaken pines that previously showed resistance to the invading nematodes," says Nickles. Researchers suspect some pine mortalities in recent years may have been mistakingly attributed to weather stress or infestation of bark beetles.

For positive nematode identification, send a small branch or chunk of sapwood in a sealed plastic bag to Dr. William Nickle, USDA/SEA/AR, Room 106, BARC-WEST, Beltsville, MD 20705.

ASSOCIATION

PGMS expansion includes 2 branches

Fulfilling a goal of expansion, the Professional Grounds Management Society chartered two new chapters in January, the North Carolina branch and the Ohio Miami Valley branch.

PGMS President John Van Vorst and Executive Director Allan Shulder are leading a move to gain more members and to consolidate allied groups into PGMS. Adding to the momentum is a certification program initiated in 1979.

Van Vorst has travelled and spoken extensively during his term. PGMS membership has risen to more than 800 in the last year. President-elect Earl Wilson is directing a review of PGMS conferences to increase attendance and gain support from allied industries.

Diamond Shamrock became the second largest producer of phenoxy herbicides in the world with the recent purchase of this plant in Tuscaloosa, Alabama. Diamond Shamrock purchased Fallek-Lankro Corp. in February. Diamond Shamrock also produces phenoxy herbicides at its plant in Belvedere, England.

Four Michigan State University Turfgrass Management students received scholarships from the Golf Course Superintendent's Association of America at the 51st annual Michigan Turfgrass Conference in East Lansing, MI. Left to right are Gary Pulsipher, Steven White, James Timmerman (GCSAA board member), Michael McElroy, and James Johnson.

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PRODUCTS

A stump grinder, Promark's Little David Model 18T, adds greater horsepower, longer reach, and dual-position axle convenience to the advantages of the Model 16D. Using its 18 hp, it removes larger stumps without need to

reposition the grinder. An exclusive dual-position axle may be set for more working capacity or towing ease.

Like the smaller machine, the Model 18T can grind stumps in minutes from two feet above ground to one foot below ground, but there is virtually no limit to the diameter of stump this one can handle.

Write No. 710 on reader service card

String trimmer is gasoline-powered for heavy lawn work and cuts a 20-inch swath with .095-inch monofilament string. This model, Homelite's ST 200, features the Idle-Line system that automatically advances string only when needed and when the engine is idle.

Equipped with a 31.1-cc, two-cycle engine and weighing only 13¼ pounds, the ST 200 has a high power-to-weight ratio. The engine is enclosed in a housing which reduces heat and noise. It has solid-state ignition for cleaner burning, increased spark plug life, and more dependable starting in any weather.

Write No. 701 on reader service card

A brush control agent that facilitates handling, measuring, and mixing procedures is Du Pont's Krenite S. It does not cause typical brown-out when applied as a foliage spray in late summer and fall. Being non-phenoxy, it can be applied near sensitive crops and even near water. Treated deciduous woody species will continue normal defoliation but either fail to refoliate or have limited leaf-bud development the following spring.

Write No. 702 on reader service card

Lawn vacuum in a 32-cubic-foot capacity, PeCo's PEU 3200, is designed for large jobs. It picks up and mulches grass clippings, leaves, thatch, and common lawn debris while the tractor

Continues on page 72

TeeJet

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SPRAY NOZZLES and ACCESSORIES From
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NEW— *QuickJet*™ Nozzle Assemblies
A unique new system of quickly interchangeable self-aligning spray nozzles and spray tips. To provide choice of spray droplet size, in full cone, hollow cone and flat spray patterns. ¾" NPT (M) inlet conn. Write for Bulletin 195.

NEW— Model 146 *DirectoValve*®
For remote "on-off" control of spray nozzles and booms from operator's location. Operates on 12 VDC system. Pressure range from 0 to 65 psi. 1¼" NPT (F) spray line connection. Write for Data Sheet 16108.

NEW— Model 244 Electrical Regulating Valve
For remote pressure control in agricultural spray applications. ¾" NPT (F) inlet and outlet conn. Operates on a 12 VDC system. Pressures to 100 psi. Write for Data Sheet 16994.

NEW— ¾" and 1" Nylon Liquid Strainers
Strainer head and bowl made of reinforced Nylon material for pressures to 75 psi. Threaded bowl can be easily unscrewed by hand. Write for Data Sheet 15353.

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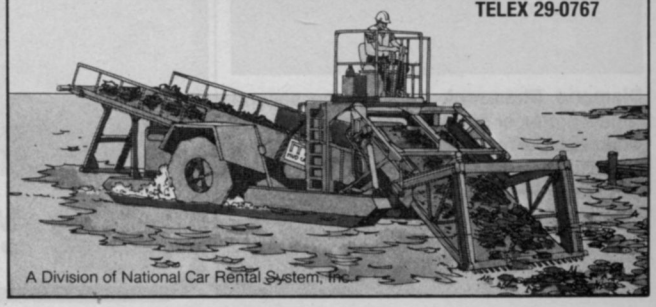

A Division of National Car Rental System, Inc.

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More precise holes. More precise rolls.

Removes uniform cores up to 3" long

Shown with optional windrow.

Shown with optional core processor.

That's the Greensaire® difference.

Precision is the name of the game on the greens. When it comes to greens aeration, the name associated with precision has been the Ryan Greensaire aerator since 1958. The self-propelled Greensaire II for 1981 continues that tradition.

The tines of the Greensaire II cleanly penetrate the turf in an up-and-down motion, removing 36 cores—up to 3" long—from every square foot of turf. Yet the process is so precise that the holes it makes should not affect the true roll of a ball.

Powered by a tough 8-hp engine, the Greensaire II takes a full 24" swath and lets you aerate up to 8,000 square feet per hour. And, with four sizes of interchangeable tines, you can achieve precisely the amount of aeration your greens need.

What's more, by attaching the optional Core Processor, you can separate and collect the thatch, and return the soil as top dressing—all in one operation.

For the same precision in a smaller size, choose the self-propelled Greensaire 16. It offers the same choice of tine sizes, and can aerate up to 4,000 square feet per hour.

Healthy greens aeration. That's the Greensaire difference. To find out why the Greensaire is the ultimate in greens aeration, complete and return this coupon today.

81-CUR-1

RYAN® TURF-CARE EQUIPMENT

Day-In, Day-Out Performance.

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The Greensaire Aerators

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operator mows the lawn. When the aluminum mulch box is removed, it doubles as a utility trailer. A universal hitch on the PEU 3200 makes it usable on virtually any 14 hp lawn and garden tractor.

Mulch removal is easy with the self-latching and self-locking door and tapered box and trailer. With a slight pull on the lawn vacuum's handle, the mulch box tips up and the door automatically disengages and swings away.

Write No. 703 on reader service card

An herbicide sprayer made by Cibolo for one-person operation is called the "Swinglok." It applies bareground herbicides under guardrails, signs, and shoulders; sprays selective treatment in the right-of-way; and applies foliar and soil-active herbicides on brush. The system attaches to the front bumper of the vehicle and incorporates special design booms for versatility and flexibility. The spray swath consists of four 9-foot sections, and selective spraying can be done up to 36 feet in the row.

Two models are available: Model A sprays one herbicide solution in a single pass down the roadside. Model BS can spray two different solutions in separate operations either simultaneously or independently.

Write No. 704 on reader service card

A hand applicator and herbicide from Hopkins Agricultural Chemical Co. achieve bare ground vegetation control around building perimeters, along fence lines, and small parking areas.

The applicator has a spreader head with three openings that gives a uniform band of granular material 12 to 18 inches wide. The soil sterilant, Urox 5.5, is a free-flowing uniformly granulated product containing 5.5% monuron-TCA which comes in a 10-pound bag. It is best applied just before plant growth begins and should achieve vegetation control for at least eight months.

Write No. 705 on reader service card

A chemical spray gun with a 37-inch brass barrel, Super Spray, sprays the tallest residential trees. Three screw-on tips provide a pinpoint, medium, or broad spray pattern. The worm-gear control on the barrel allows fine flow control and prevents "water hammer" caused by sudden shut-off. Super Spray is a Bar-Spray accessory that connects to a 3/8-inch, 1/2-inch, 3/4-inch, or 1-inch hose.

Write No. 706 on reader service card

Inductive antenna coil, the Tracker II Cable, Wire and Pipe Locator, comes from Progressive Electronics. When

Continues on page 74

Write **142** on reader service card

Now the Cushman® Runabout

Rolls up even greater savings.

Labor savings. Cost savings. All rolled up in one turf utility vehicle. That's what the Cushman 18-hp Runabout is all about. And now, with 50% greater payload capacity, it can save you even more on those big turf jobs.

The 18-hp Cushman Runabout can mobilize a grounds maintenance crew of two, and haul up to 1,500 pounds of cargo. So your men can carry more equipment or supplies in the Runabout's standard 4½′ pickup box, saving trips from supply areas to the field.

The Runabout is a labor-saver from the word "go." Its wheel-type steering and tight 17′ turning circle make the Runabout maneuverable and easy to handle. Special tires make it easy on turf, too—even under full load. And its 3-speed synchromesh (second and high) transmission and heavy-duty tubular steel frame make the Runabout about as reliable a turf vehicle as you can find.

Choose from a full-line of accessories too, like an enclosed cab, hourmeter and tool box, to make your Runabout even more versatile.

For even greater savings, the fuel-stingy 12-hp Runabout lets an operator handle 1,000 pounds of cargo with responsive handlebar steering. And, like its big brother, this Runabout runs on regular gas, and is backed up by Cushman's worldwide dealer network.

To see how the Runabout can roll up savings for you, ask your Cushman dealer for an on-turf demonstration soon. Or complete and return this coupon, today.

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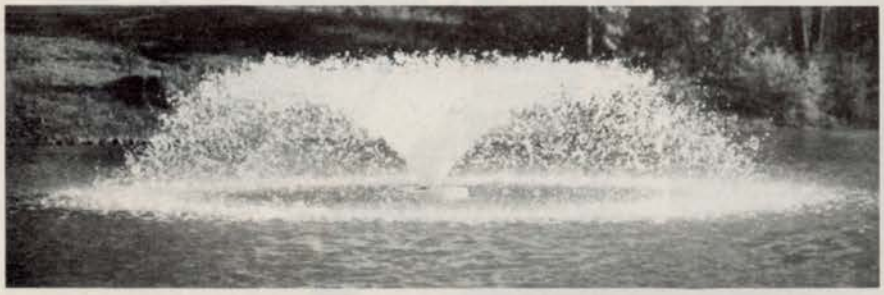

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Products *from page 72*

placed on the ground in the vicinity of the suspected utility, the activated antenna will accurately detect it for reasonable distances. New models are available with built-in antenna coils or a program to retrofit existing Model 500C cases.

Write No. 707 on reader service card

Pow-R-Wedge chain saw-powered log splitter from Leeco has been changed and now features a new style wedge

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Write No. 708 on reader service card

Portable mixers by Nettco can handle most open-tank mixing applications. These gear-driven mixers have a gear reduction ratio of 5:1, which produces a 350 rpm mixing speed. They have very few moving parts and are equipped with standard C-face motors for off-the-shelf replacement; large, widely spaced bearings for maximum shaft support; and large diameter shafts that prevent whip.

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Continues on page 76

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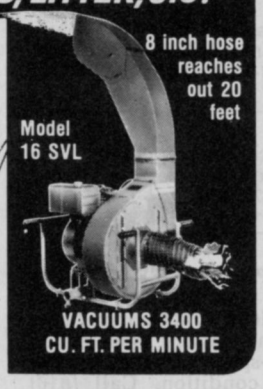

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Aquatrols Corp. of America.. 74
Atwater Strong Division 76
Barebo, Inc. 74
BASF Wyandotte Corp. 17
Big John Tree Transplanter Mfg. 3
Brouwer Turf Equipment Ltd. 51
Conwed Corp. 30
Cushman 13
Deere & Co., John 20, 21
Diamond Shamrock/ Ag Chem. 26, 27
Dow Chemical U.S.A. 38, 39
FMC/Bolens Corp. 73
Flexitube International Corp. 54
Glenmac Inc. 76
Gordon Corp., PBI 62, 63
Hahn, Inc. 66
Hoffco, Inc. 2
Hopkins Agricultural Chemical Co. 57
International Seeds, Inc. .. 8, 25
Jacobsen/Div. of Textron Inc. .....COVER 3
Kawasaki Motors Corp. 65
Kut-Kwick 34
Laval Corporation, Claude... 44
Lofts Pedigreed Seed, Inc. .....COVER 4
Long Mfg. N.C. Inc. 29
Manhattan Ryegrass Growers Assn. 36
Mathews Company 3
Monsanto 45
Mott Corporation 69
National Car Rental 70
Olin Corporation 64
Opdyke's Truck Sales 54
Pickseed West Inc. 31
Princeton Mfg. Co. 24
Rhone Poulenc Chemical Co. 42, 43
Rugby Kentucky Bluegrass 52, 53
Ryan Turf-Care Equipment .. 71
Solo Incorporated 72
Spraying Systems Co. 70
Tecumseh Products Co. 49
Tee-2-Green Corp. ....COVER 2
Telsco Industries 58
Tennant Company 66
3M Company 58, 59
Toro 55
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